This Week in The Iron Age

Editorial

Bottlenecks 29

Technical Articles

Limitations of Powder Metallurgy 31
Indium 35
Influence of Basis Metal on the Plate 39
Flame Hardening Cast Iron Bearing Rings 44
Welding Sheet Copper 46
Brass Die Castings 48
What's New in Power Transmission 51

Feature Reports

On the Assembly Line 56
Washington News 60

News and Market Reports

News of Industry 66
Personals 90
Obituaries 92
Metal Working Activity 93
Comparison of Prices 94
Summary of the Week 95
The Industrial Pace 96
District Market Reports 98
Machine Tool Activity 104
Non-Ferrous Market 105
Scrap Market and Prices 106
Construction Steel 108
Iron and Steel Prices 110
Ferroalloys, Pig Iron Prices 115
Warehouse Prices 116
Sales Possibilities 118

Fatigue Cracks 64
Free Industrial Literature 67
Products Advertised 124
Index to Advertisers 156

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The Iron Age

DEC. 19, 1940

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Bottlenecks

WE hear a good deal about "bottlenecks" nowadays. Industrial bottlenecks. Much of what we hear on this subject comes from people who do not know a great deal about industry. You do not hear industrial experts saying much about bottlenecks, because they are familiar with them. They have contended with "choke points" every day of every year that they have been a part of industry and they will continue to contend with them as long as they remain a part of it.

You cannot make a bottle without a neck, for if you did it would no longer be a bottle. Even a milk bottle has one. And you cannot make an industry that hasn't a potential choke point. Plants are not made of rubber.

What the layman doesn't understand is that a bottleneck is a matter of relativity, whether in an industrial plant or in a bottle. The neck does not become a choke point until you try to get too much out of the bottle in too short a space of time.

Take the steel industry, for example. We hear demands, again from laymen, for a sharp enlargement of capacity. Yet during the past five years, the utilization of existing capacity of the steel industry of the United States has been but 65.5 per cent. Expressed in another way, if the industry had been kept busy at its optimum production rate of 85 per cent over that period, it would have produced 80 million more tons of steel than it did. Enough additional steel to take care of 10 armament programs.

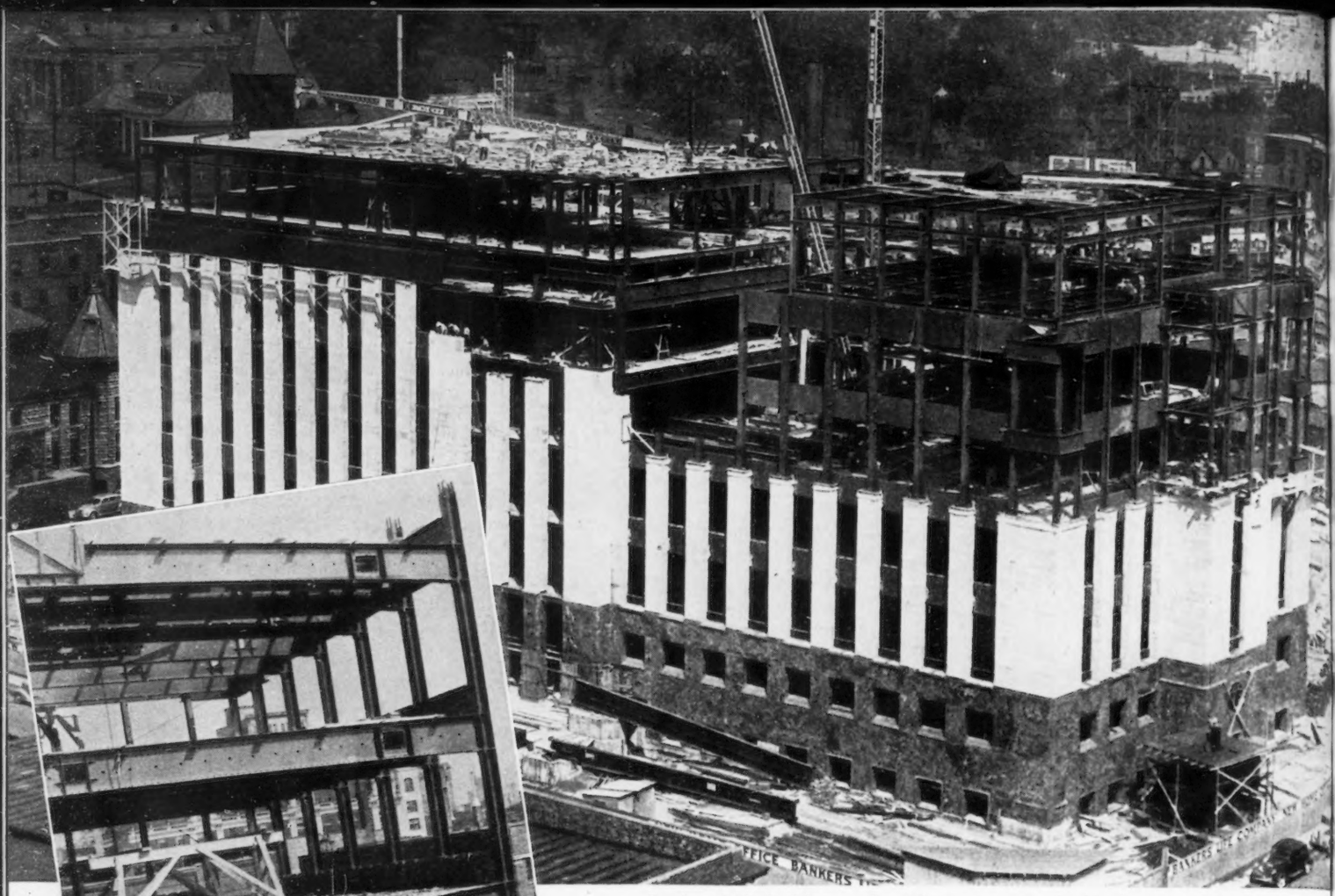
What these people really are asking for is not the elimination of a bottleneck but the enlargement of a bottle that has been demonstrated already to have twice the capacity required by any normal demand.

The same thing is true of the machine tool industry, although not in like measure. This industry has expanded its capacity fully six times in the past four years. You could not expect any industry to expand faster than that and not catch on fire from spontaneous combustion!

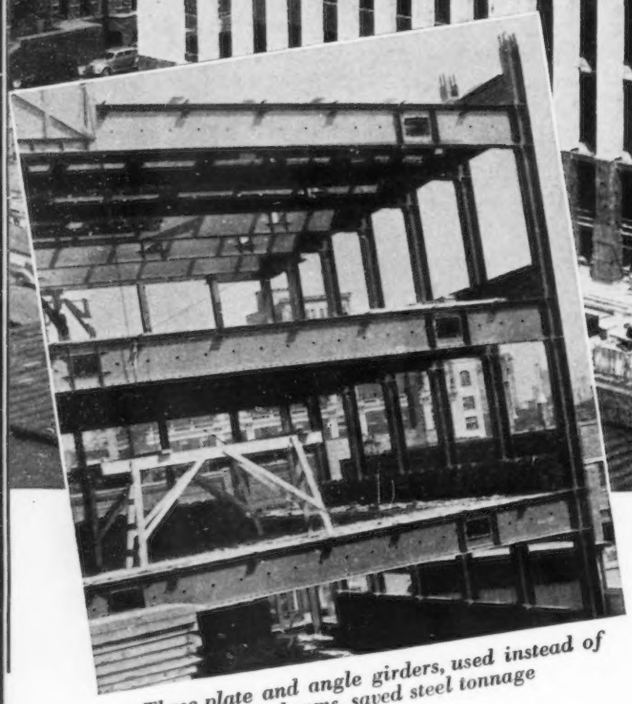
The machine tool industry is devoting at least 80 per cent of its output to the defense program. Thus far, the steel industry has been able to fully satisfy requirements for the defense program and exports to England and Canada from less than 20 per cent of its present normal capacity. That means that more than 80 per cent of its output is going into non-defense projects.

There are certain steel companies that have been so loaded with defense orders that they have had or will have to expand individual capacities. But that does not change the fact that the industry as a whole still has a very substantial reserve margin that could be switched from peace purposes and products to war purposes if required.

It might be well to think twice before we permit clamor to stampede an industry into staggering capital investment expansions that may turn out to be white elephants. The public always pays the upkeep charge for idle plant capacity, either in prices or taxes.



Bankers Life Building at Des Moines gained valuable floor space by using special built-up girders



These plate and angle girders, used instead of simple beams, saved steel tonnage

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Limitations of Powder Metallurgy

By EARL S. PATCH

Moraine Products Division, General Motors Corp., Dayton, Ohio

THE powder metal industry is today showing so much activity that many are finding it difficult to define the limits of application. Therefore, this article is particularly timely in that it sets forth the commercial limitations of powder metallurgy. These data were originally presented at a recent meeting of the Newark Chapter of the A.S.M.

o o o

LIKE every other important development in this technical world, the commercial limitations of powder metallurgy are reduced largely to the basic three factors that are so familiar — material, men, and machines.

As is well known, the early development of powder metallurgy was built largely around the desire for metals and technical characteristics that were not obtainable by conventional melting methods. It was the development of the electric lamp filament by methods that were commercially feasible that led to a broader study of the possibilities of metallic powders, which work resulted in present-day products.

The first of these newer products, of less unit value than the filament material, was the so-called "oilless" bearing. There are probably in use in this country, today, a billion or more of these bearings. Their development has been, in many respects, an engineering triumph, and their economic advantages have made profitable manufacture possible. This development, in turn, has carried the industry over into the study of those problems relating to articles of lower unit value.

It is an interesting thought, in this connection, that the earliest competition which the so-called "oilless" bearing had to meet was that of the wood bearing. Thus, as is so often the case, a synthetic product capable of accurate control gradually replaced a natural product which was subject to all the variations of nature.

This is the background, then, for the present-day developments in the industry of things of mechanical nature—things to replace parts made by other methods. Fundamentally, powder metallurgy is believed to be a rapidly developing technique capable of taking its place along with drop forging, die casting, synthetic molding, screw machining of bar stock, and similar basic operations in the repertoire of the production engineer.

The writer can well recall, 30 years ago, his first contact with die castings. An advertisement was noticed in the old *American Machinist*, of the H. H. Franklin Co., Syracuse, offering to send a sample die casting to anyone who was interested. One was sent for, and it was treasured for years as representative of a new manufacturing technique. The casting had reasonable accuracy—it had cheapness, appearance, and just about every surface quality that could be desired. Underneath this surface, however, it was low in tensile strength, had very little shock resistance, and was subject to such problems as inter-crystalline growth. Because of all this, it was probably 20 years before die casting really became a prominent factor in American industry. Today, is is accepted as a standard method of producing parts.

Before this acceptance developed, however, an enormous amount of work was necessary in the laboratories of the die casting industry. Furthermore, designers had to learn how to design for die castings rather than attempt to duplicate in this new material a design which had been satisfactory for some other mode of production.

Such is the state of powder metallurgy today, and this emphasizes the current dependence of the art on the first and second factors—material and men.

The development of powder metallurgy has carried from the rare metals into the cuprous metals, and now today is at the threshold of wide-spread use of the ferrous materials. This probably represents about the final stage in the material development. It is hard to visualize at this time much lowering in cost beyond that which is possible through the use of iron powder. For this reason, laboratories, men, and equipment are being used primarily in the solution of problems involved in the metallurgy of powdered iron.

From an economical standpoint, the

° ° ° **REPRESENTATIVE parts made from iron powder. The porosity is about 25 per cent and the tensile strength is about 25,000 lb. per sq. in. The H-shaped piece to the right is used in a textile machine, the two small pieces in front of it are used in a push button radio tuner, next are three pieces from a dictating machine, the two next pieces are a clutch cross shaft release bearing, at the extreme left is an outboard motor gear case bearing, and behind it is a gear for an auto oil pump.**

use of iron powder offers several major advantages somewhat akin to those offered by die castings. In the first place, a finished article can be provided having some rather definite physical factors, without waste of either stock or of finishing time. An example of this is the manufacture of spur gears. It is possible to make such small gears, finished, at costs which are from one-half to three quarters of the cost of finished gears machined in the conventional manner from castings. This, of course, is due to the fact that the ratio of machining cost to material cost is high in the conventional process. With powder costing 10c. per lb., or less, it is possible to have a net gear cost which is slightly less than that of a casting, even though small gray iron castings can be bought for around 4c. per lb.

What, then, are the limitations which prevent powder plants from getting all of the gear business in this country? The gear has been selected as being a rather typical unit in machine design, and one with which all readers are familiar. It does have a unique advantage in that the ratio of finishing cost to material cost is high, although this does not represent the high limit in this respect by any means. Taking a gear, then, as a good example for a general study, what are the limitations to which powder metallurgists have to work?

In the first place, consider the material. Gears can be made from iron powder experimentally with a tensile strength of as high as 100,000 lb. per sq. in. If this is done, it is necessary to use much higher pressures than generally employed in briquetting operations. The heat treatment must be longer and at higher temperatures. The powder must be more carefully controlled, and tool wear is inclined to be excessive. Therefore, inasmuch as most gears are designed for resistance to wear rather than for ability to withstand shock loading, particularly in those applications where large numbers are possible, it has been found desirable to furnish some gears with tensile strength as low as 25,000 lb. per sq. in. The wear resistance properties of such gears are generally ample. Therefore, by using less material there is less wear and tear on tools, and short cuts in heat treatment and powder control are possible. Thus, costs can be reduced sufficiently to make production of the part attractive and profitable. Strength in one gear now being made is entirely satisfactory at 18,000 lb. per sq. in. There is no need in providing higher strength than that which is necessary for the safe functioning of the piece.

For purposes of quietness, powder metallurgists would like to make helical gears. In the present state of the art, however, it is not known how this can be done commercially. Some have been made experimentally, so therefore the operation is not impossible. However, it is impracticable. The result of all this has been that powder plants have been forced into a careful study and design of tooth contour, shape, smoothness, etc., in order to provide quietness in operation comparable to that of the helical gear. This is where the designer has to come in.

For some jobs, a low strength is not sufficient, and it is necessary for powder metallurgists to improve physical characteristics, with tensile strength up to 45,000 to 50,000 lb. per sq. in., for instance. This is possible, as already stated, by increasing briquetting pressure, sintering time, or certain other manufacturing variables. However, this can only be done at increased cost. The tool cost is increased, and they wear out quickly. The manufacturing operations, themselves, are more expensive than with the lower strength material, but a product is secured which meets the requirements of the job. Such an application, for instance, might be the

drive gear of a washing machine rack bar. For this, there is available in iron metallurgy a wide field of alloys and heat treatments, including quenching, and from all this it is possible to commercially produce gears having much higher wear resistance, strength and impact resistance than case hardened low carbon steel.

In the gear field the powder metallurgist may find it impossible to meet all of the dimensional tolerances which may have been laid down for producing the gear by some other method. Some gears, for instance, show an axial length tolerance of plus or minus 0.00075 in., along with a diametral tolerance on the pitch line of perhaps the same amount. It is possible to hold the diametral allowance, but axial tolerance cannot be held, mainly because all of the variables are largely reflected in length of the briquette, or of the sintered and sized piece. For a replacement job, therefore, a final finishing operation is necessary to hold to the length tolerance which is given, whereas the same diametral tolerance can be held without touching the tooth surface.

This is the fundamental difficulty in adapting the methods of powder metallurgy to designs which were made with other materials in mind, and it definitely brings home the importance of designing for the use of powder metal parts.

There are a few basic things which affect the type of product which can be made by powder metallurgy. They are as follows:

First—the material does not flow freely, and as a result pieces having reentrant angles cannot be formed. This is pretty much fundamental in the processing, and is made more important by the fact that it is necessary to compress the powder to anywhere from one-half to one-third of its original powder volume. This means that where reentrant angles are formed at any point along the axis, it is necessary to depend on conventional methods of machining for those surfaces.

Second—length tolerances must be somewhat more liberal than those necessary with conventional methods of finishing, if extra machining costs are to be avoided. Thus, it is desirable to exercise reasonable control in length. Each design must, of course, be considered individually, but in general a length tolerance of less than plus or minus 0.005 in. is liable to result in machining and unnecessary cost.

Third—concentricity must be considered carefully, and a reasonable limit on eccentricity provided. This is necessary because the powder is formed largely with tools which have radial fits within one another, and clearance must be provided. In some circumstances, these fitted pieces are liable to go all in one direction, resulting in a build-up of tolerance which may show eccentricity as high as 0.003 in. in some cases. This eccentricity can be largely guarded against by a compression operation, swaging, rolling, or something of the kind, but here again additional handling is necessary at additional cost.

Fourth—the design must be such as would normally require a considerable cost for machining, as compared to the cost of material. As already stated, with powder costing 8c. or 10c. per lb., it is most attractive to have the finished weight of the piece to be around 50 per cent of the rough blank weight, whether the blank be of gray iron or steel, because within this zone lies the powder metallurgist's best opportunity for economical and profitable production.

Fifth—there must be a reasonable quantity. This, like every other factor, is largely related to the design of the particular piece. Generally speaking, the more complicated the machining of the piece by conventional methods, the smaller the annual consumption necessary to carry the considerable expense for tools and equipment to handle powder. With vast quantities, pieces made oversize in accordance with suggestions already made, there is practically no method of forming parts to accurate dimensions which is cheaper than powder. It is possible, for instance, to turn out lots of tens of millions a year. This is being done with a flanged bronze bushing, at costs that are insignificantly higher than the cost of similar pieces made from flat strip stock. This, however, is only accomplished by the spending of perhaps $40,000 or $50,000 for special equipment and tools to make the piece. Once made, the operation is set for perhaps ten years. On the other hand, there are some pieces which represent the other extreme, where a tool expense of $1,000 is warranted on lots of 10,000 pieces, or less, per year. This is largely due to the fact that in some such cases it is possible to avoid very expensive machining. Incidentally, expensive machining in these days of

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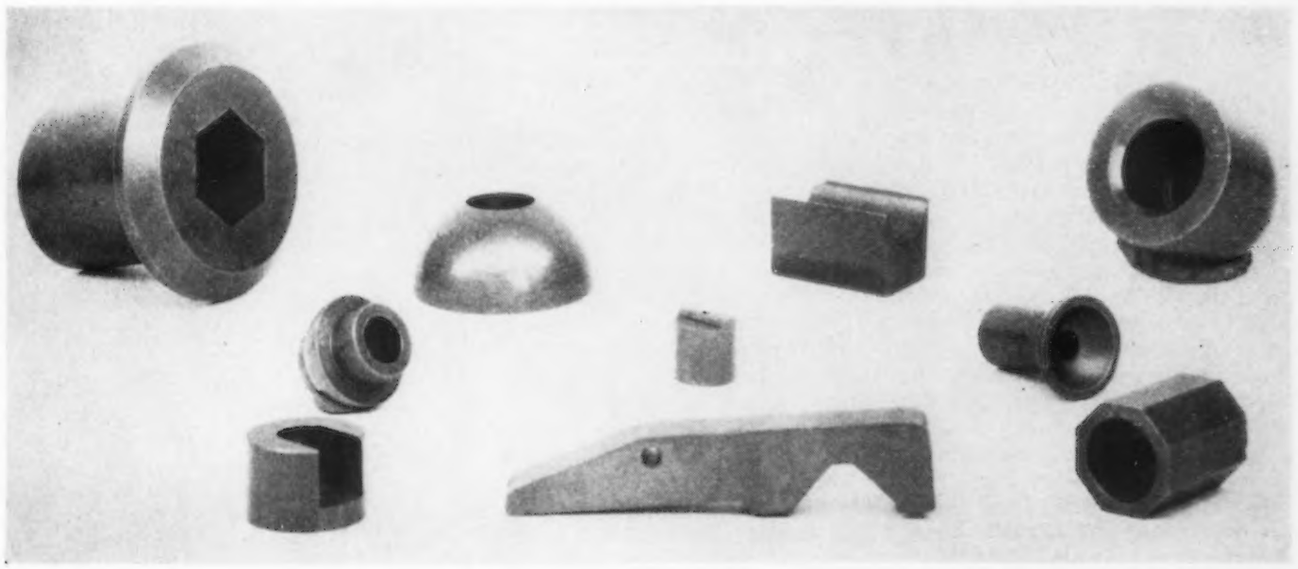
TYPICAL molded parts made from bronze powder. This powder is made up of 90 parts copper, 10 parts tin, and 2 parts graphite.

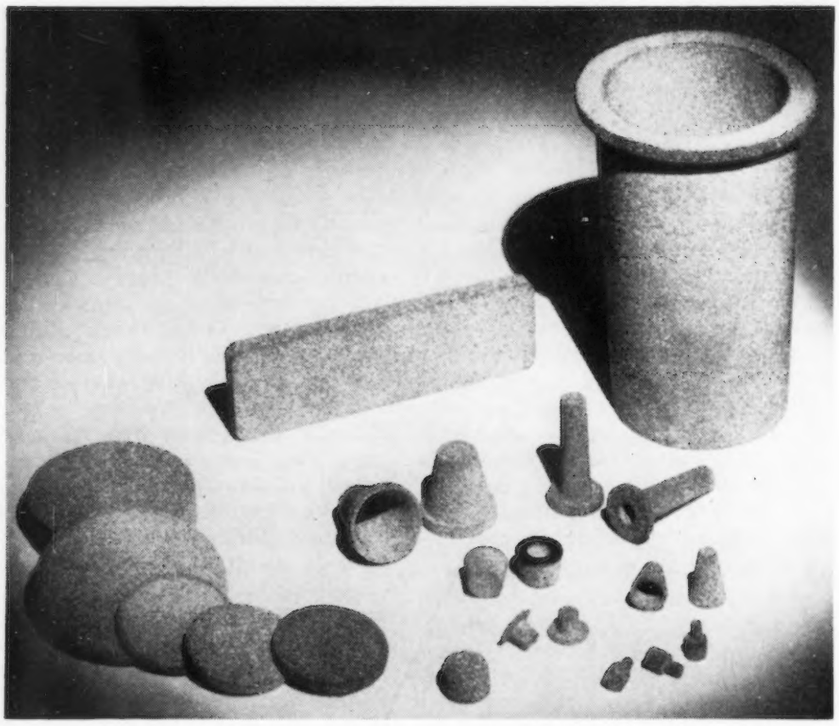


high wages and high factory expense is something to be considered carefully. In some plants with which the writer is familiar, it costs, in labor and burden, about a nickel a minute to perform a machining operation. The days of government jobs, such as one which the writer keenly remembers when he was an apprentice boy, of making collar buttons from brass rods, are just about over with.

Within the framework set forth herein, there are an enormous number of parts used in industry which can well be made both economically and profitably from powder, and it is going to be of national interest and advantage to do this.

For several years the industry has largely used powder made from ore from the well known Swedish mines. This is, of course, out of the question today, and the writer's plant is now producing iron powder from domestic sources, which powder is completely satisfactory. Many other people are working along similar lines—there are at least 28 different groups in this country studying with some seriousness the question of making iron powder, and some of these groups are not only in production but are also adequately financed. Thus, there seems no doubt but what there will be an adequate source of domestic material available at a constantly lowering of price.

The next problem facing the powder industry is that of getting adequate information on what can be done into the hands of the engineer, the designer, and the draftsman. This is a tough job, and is exactly the same one that has been faced by the die casting and plastic industries. Probably, it can only come from slow development, although everything possible is being done to accelerate it. As an illustration of what can be done when sympathetic hearings and opportunities to work are provided, consider the following case. For years, Moraine worked closely with one large industry, and particularly with two large interests in this industry. They are making machines of the same general type in very large quantity. With one of these interests it was not found possible to work directly with the designers and draftsmen, the result being that only seven or eight parts made from powder are used. With the other interest, where the engineers are highly in sympathy with the use of powder products and are constantly open to suggestions, there is a total of 21 pieces used. Every one of these additional pieces were put into the machine with a considerable saving in the cost of the product. Every one of them, however, had to be designed within the framework discussed herein.



A VARIETY of filters made from bronze (92 Cu-8 Sn, by weight) powder. The porosity is about 50 per cent, and the filters will remove 0.001-in. diameter particles. The large filter to the right is about 5 in. in length and is used to filter fuel in a Diesel engine. Some of the others are for the same purpose, and several are used to filter refrigerant liquid. Filters are also being developed for use in domestic oil heaters.

Another limitation, occasionally encountered, is this question of cost. Necessarily, those in the powder metallurgy business have to know their costs pretty well in order to compete with the machine shops of their customers. Frequently, however, plants served do not know their own true costs. A departmental burden rate should be used in practically all manufacturing plants, particularly in those that have any thought of bringing in a new process, or parts made by outsiders. Consider the case of gear making, for instance. It is questionable whether any high production gear development can be operated in a manufacturing plant for less than 250 per cent burden, whereas the overall factory burden rate may be around 120 per cent. Unless departmental burden rates are set up and used, an entirely false idea of costs may be built up which may so distort the picture that a new process such as powder may not be given adequate consideration. Too many plants do not have department costs specialized to a point where they show the actual cost, rather than an accountant's averaging out. This is really an important factor in the rate at which powder metallurgy can come into more general use.

There has been a lot of misunderstanding in the various trades served by powder metallurgy as to the results that can be accomplished. It has been a most difficult job to attempt to draw the line between the things which can be accomplished in the powder laboratory, and those which can be produced economically in the factory. There is no question that by proper treatment, as already mentioned, results can be obtained from the use of basic powders which will rival results obtained with steel or other materials. The same thing can be said of die castings or of plastics. Many parts can be made of iron powders with very low to moderate strength values at lower cost when the design is in line, than similar pieces can be made by any other process. But it is impossible at this stage of the game to get the higher values of strength, which are available in the laboratory, excepting at costs that throw away all advantage.

Indium

—This rare metallic element is rare no longer, and today is finding use in a variety of industrial applications. Herein are data as to the properties and uses, as well as detailed instructions as to plating and thermally diffusing the metal.

By J. R. DYER, JR.
Technical Director, Indium Corp. of America

o o o

INDIUM, so named because of its indigo spectrum, has been since only the past few years a rare metallic element following its discovery in 1863 by Reich and Richter. Indium belongs to the aluminum group as regards properties, being a very soft, silvery metal, not acted on by water or air. It melts at a very low temperature, at 155 deg. C. (311 deg. F.), and boils at red heat. It is fairly heavy, having a specific gravity of 7.28.

In 1924, an order was placed with a prominent New York chemical house for a substantial quantity of indium. After several months' effort one gram was found and purchased, it being all that was then available in the world. The price was $10 a gram, considerably higher than platinum. The metal was found to be particularly valuable as a stabilizer for certain non-ferrous metals, and uses in other directions were indicated. Therefore, with demand increasing, attempts were made to secure quantities at a price considerably lower than that demanded for the first gram.

After considerable searching, sizable quantities of indium bearing ores were found in Mohave County, Arizona, and the property was thoroughly examined by means of a shaft and driftings. However, demand for the metal has not yet become sufficient to justify exploitation of this property for the indium content alone. So far, the indium coming onto the market has come out of zinc refineries in the same area, as indium is usually associated with zinc in small quantities. Electrolytic indium, 99.99+ per cent pure, now sells for $30 a troy ounce; commercial indium, 99.8+ per cent pure, sells for $15 a troy ounce; and the metal is also available in various salts. Over the next few years, with the use of indium growing, the price will undoubtedly drop considerably lower, according to Indium Corp. of America, 60 East 42nd St., New York.

Probably the first use of indium was in dental castings, where it was found that quantities from 0.5 to 5 per cent greatly improved the dental alloy insofar as corrosion resistance, melting range, hardness and strength were concerned. Next, a large optical company indium treated the small pins in the hinges of spectacle frames in order to increase corrosion resistance. These pins had always given considerable trouble by corroding because of body perspiration. Indium's latest development and probable major use for some time to come is protection against wear and corrosion in internal combustion engines, particularly for the bearings. It has been particularly effective in the airplane engine field, and only lately the White Motor Co. has advertised indium treated bearings, of the aviation type—copper, lead bearings impregnated with indium to prevent deterioration due to acid condition in the oil. The metal indium is also showing excellent experimental results in the electrical contact field as well as in the field of low melting alloys.

Indium, used to protect metals against corrosion and wear, is usually plated onto a base metal, and then diffused or alloyed to the surface by a low temperature treatment.

The patented procedure used with complete success in the indium plating of metal pieces is as follows:

Racking: The pieces to be plated are racked in a suitable manner so that the back of the piece is protected. This may be done by employing a rubber

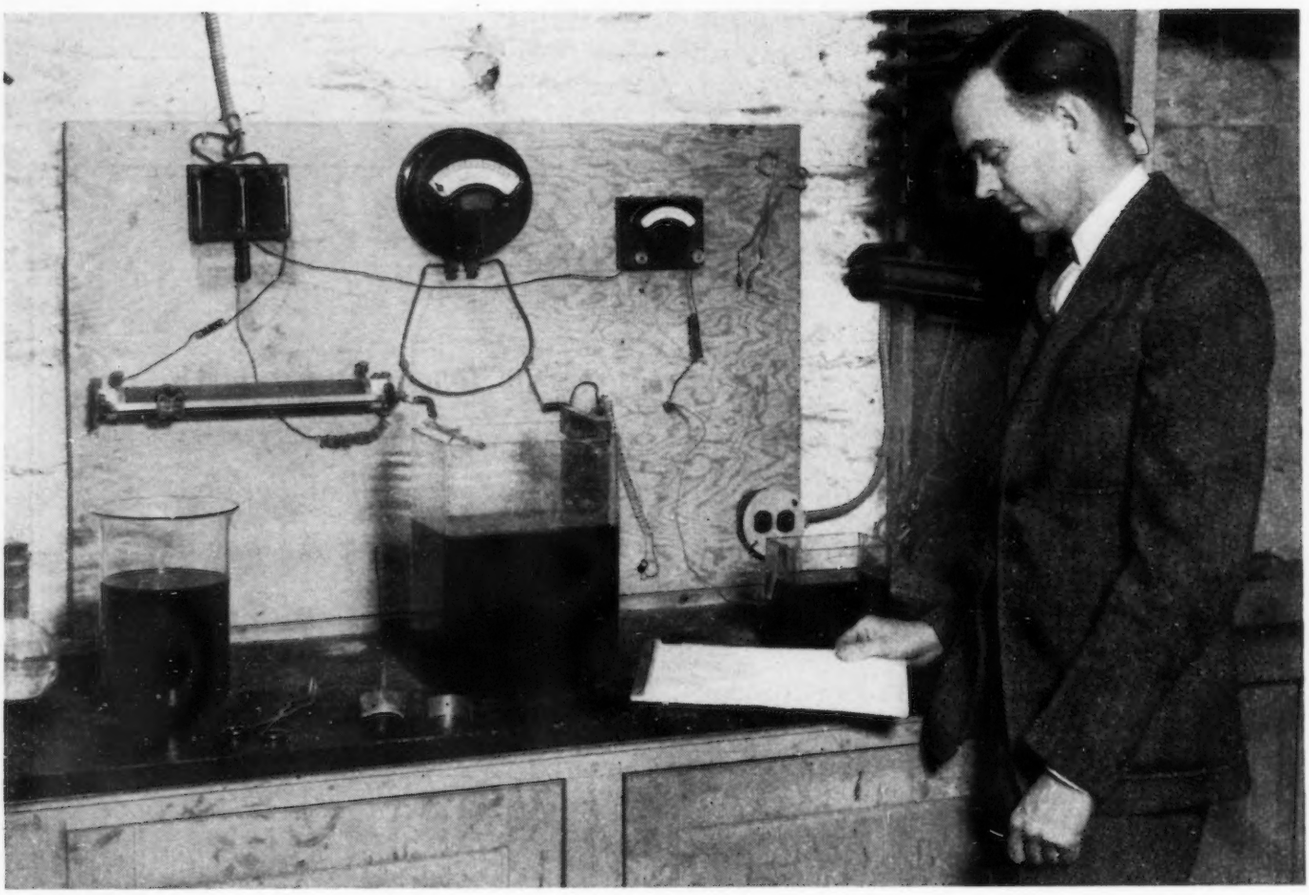


FIG. 1—Indium plating layout. The plating bath is in the center—the cleaning bath is at the right, and rinsing bath is at the left. In the foreground is a plated bearing (right) and a cathode holder (left).

band or a rubber sleeve into which the pieces are slipped, good contact being made with the cathode wire on the back of the pieces by the pressure of the rubber band. That part of the band, if used, which stretches across the face of the piece will not produce an appreciable amount of shielding action—the bath has exceptional throwing power.

Cleaning: The racked pieces then are immersed in a hot alkaline electrolytic cleaning bath for 10 to 20 sec., made the cathode, and sufficient current (10 amp. per sq. ft.) is applied to give a good evolution of gas over the surface. When clean the pieces are removed and rinsed twice in running water; the first rinse is preferably warm water, and second rinse cold water. The pieces are now ready to be plated with indium.

The composition of the alkaline electrolytic cleaning solution may vary to suit requirements, i.e. greasy articles require a more concentrated solution. However, no matter what cleaning method is used, the article to be plated must be clean and free from "water break." A suggested formula for the cleaning procedure is as follows:

8 oz. of sodium carbonate (or tri-sodium phosphate).
2 oz. of sodium hydroxide.
1 gal. of water.
90 to 100 deg. C. (194 to 212 deg. F.) operating temperature.
1 oz. of sodium cyanide may be added to remove stain.

Plating: The pieces now are plated with indium (see Fig. 1) by immersing them in an indium cyanide plating bath and using a current density of 0.1 to 1.0 amp. per sq. in. The time required, of course, depends on the rate of deposition of the bath and the amount of indium required for the protection of the pieces.

The indium cyanide plating bath consists essentially of the following for 1 gal. of plating solution:

4 oz. troy of indium (as chloride).
2 oz. of dextrose.
12 oz. of sodium cyanide.

Making of Bath: To make the indium chloride solution for a 1 gal. bath as an example, 4 oz. of indium metal are cut into small pieces and converted to the chloride by dissolving in CP HCl of sp. gr. 1.16. About 15 to 20 oz. of the acid will be required to put the metal into solution, and gentle heat is applied to effect solution of the last pieces of metal. The solution of indium chloride ($InCl_3$) is now heated to volatilize any excess acid, or, until the surface of the solution is slightly encrusted. Care should be taken to see that the solution does not "freeze" by being heated too long or allowed to cool without dilution. The encrusted solution is now diluted with distilled water to a volume of 500 c.c. This solution is called the stock indium chloride solution. Stock indium chloride solution may be purchased as indium trichloride in solution—one fluid ounce containing one ounce $InCl_3$. One 8-oz. bottle of this solution is generally used to make 1 gal. of plating solution.

Two ounces of dextrose (No. 84 Eastman or Merk's USP or equivalent quality) are dissolved in as little water as possible. Slight heating may be used to hasten solution and, if used, the solution is allowed to cool before using. Then, 12 oz. of sodium cyanide are dissolved in as little water as pos-

sible, approximately 750 cc. by means of a solution cone, and, when all the cyanide has dissolved, the dextrose solution is poured into the cyanide solution. The resulting solution is known as the sodium cyanide-dextrose solution.

The indium chloride solution is now added, in small portions, with constant stirring, to the cyanide-dextrose solution. This operation should only be carried out in a good fume-hood, or other well-ventilated place, owing to the generation of *dangerous fumes*. As the small portions of indium chloride solution are added, it will be noticed that a precipitate is formed which dissolves on stirring. Under no conditions should more chloride solution be added until this precipitate is dissolved. However, the solution of this precipitate should take place almost immediately and no permanent precipitate should exist at this point. All the chloride solution should be added in this manner to the cyanide-dextrose solution and the resulting solution diluted to about 2 liters or ½ gal. with distilled water. This concentrated plating solution should be allowed to stand at least 48 hr. or longer, if possible, before using to make the final bath.

After the concentrated solution has aged for 48 hr. or longer, it will be found to have turned from a straw color to dark brown. Also, a dark carbon-like precipitate will be found to have settled out. This precipitate should not be gelatinous or of considerable volume and may readily be filtered off. The solution is now filtered, by suction through a Buchner funnel for speed, using a Whatman No. 54 filter paper, into the plating tank and diluted to 1 gal. with distilled water. An analysis for free cyanide should be made at this point, and it will be found that the free cyanide will be one-third to one-half of the required bath composition, as stated above. Sufficient sodium cyanide should, therefore, be added to bring the free cyanide content of the final bath to 12 oz., or at least 100 gm. per liter. The plating bath is now ready for use.

Operation: To operate the bath an insoluble anode is used, such as carbon or platinum, etc., and a current density high enough to give gassing at the cathode (0.1 to 1.0 amp. per sq. in.). The resulting plate or deposit is soft, gray and matte-like in appearance.

Rate of Deposition: The rate of deposition of the bath is determined by plating a weighed cathode for a definite length of time at a current density which is expected will be used for operation. The rate of deposition may readily be calculated from these data. It will be found that the rate of deposition of a new bath will run in the neighborhood of 15 mg. per amp.-min., and that as the bath is used or ages the rate of deposition gradually falls off until at about 5 to 8 mg. per amp.-min. it remains fairly constant. Depletion of metal in the bath or of free cyanide may still lower the rate of deposition, at which time additions should be made to maintain the efficiency of the bath.

Maintenance: Since insoluble anodes are used, all metal plated is from the bath, and must be replaced by addition to the bath. Analysis of the bath and/or a record of the plating will show when these additions are necessary. If additions are necessary, they are prepared, in the required concentrations, as in the original preparation of the bath, and are added to the bath in the concentrated solution after filtering but not diluting.

The cyanide content should not be allowed to fall below 11 oz. per gal., or 90 gm. per liter, and preferably maintained at 11 to 13 oz. per gal., or 90 to 100 gm. per liter. The indium content should not fall below 3 oz. per gal. for consistent plating results.

Analyses: The method of determining the amount of free cyanide in the bath is the same as that for a silver plating bath (by means of silver nitrate), with the possible exception that the sample should be diluted to several times its volume in order that the color will not obscure the end point.

The indium content is determined by breaking up a sample of the bath with aqua regia; precipitating the indium as hydroxide with ammonium hydroxide; filtering; washing the precipitate with ammonia water until nice and white; the igniting of In_2O_3 over a moderate flame; and from the weight of oxide, calculating the amount of indium. A careful record of the analyses, additions and rate of deposition should be kept.

Diffusion: The plated pieces are removed from the plating bath and given several water rinses. The first rinse should be hot, and should be retained as it will contain considerable drag-out, the final rinse should be in clean hot water. The pieces are now ready for diffusion.

Diffusion means heating the plated

FIG. 2—Indium chloride is sold in the form shown, for use by the plater. Two solid bars of indium metal also may be seen. An automobile connecting rod half-bearing, plated with indium, is shown in the foreground.

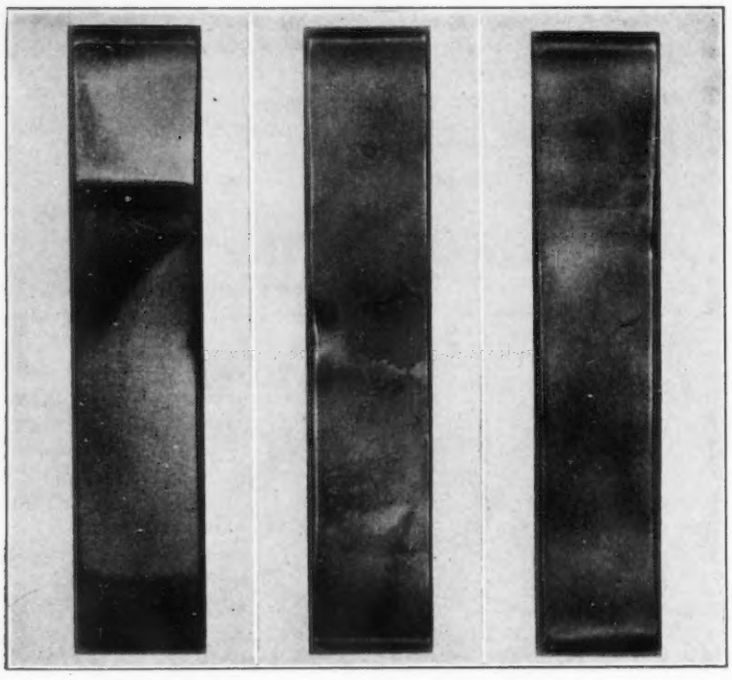


FIG. 3—Specimens from bearings after corrosion test. (Left) Cadmium-silver-copper bearing; diffused 96 hr. at 340 deg. F. in corrosive oil; loss, 0.1370 gm.; badly corroded. (Middle) Bearing plated with 0.0170 gm. indium; diffused 18 hr. at 340 deg. F.; 144 hr. at 340 deg. F. in corrosive oil; loss, 0.0290 gm.; visibly corroded. (Right) Bearing plated with 0.0290 gm. indium; diffused 2 hr. at 340 deg. F.; 216 hr. at 340 deg. F. in corrosive oil; loss, 0.0120 gm.; no visible corrosion. Photo courtesy A. I. M. E.

pieces to a temperature above the melting point of indium and maintaining that temperature long enough to permit the indium to diffuse throughout the base metal. This may be accomplished by means of an oil bath or an oven under an inert atmosphere or having no air circulation. Indium as-plated is very soft; after diffusion it will be found to have hardened, or actually to have alloyed with the base metal.

The time of diffusion employed with success and without danger of weakening the bond on steel-backed type pieces, is 2 hr. at 340 deg. F. The pieces are permitted to cool slowly and are ready for use without further treatment.

Engine Bearing Tests

As already mentioned a major use of indium, plated and diffused as described herein, is in the protection of engine bearings. (See Figs. 1 and 2.) Modern engines have high bearing loads and elevated operating temperatures. These conditions have caused engine manufacturers to turn from those bearings having low fatigue value to those alloys which have greater strength and wear, such as cadmium alloys, lead alloys, copper-lead alloys and cadmium-nickel alloys. Unfortunately these alloys are susceptible to corrosion in the presence of lubricants containing organic acids. These acids may have been derived from additions of animal or vegetable oils, or by oxidation of some petroleum oils under operating conditions.

Additions of fractional percentages of indium metal to bearings in the finished-machine state, as reported by C. F. Smart in a paper presented before the A.I.M.E., showed the beneficial effects of the addition of indium in laboratory beaker corrosion tests, by bearing tests and by engine tests. Comparative tests by one of the major oil companies confirm his conclusion.

In one engine test, connecting rod bearings lined with cadmium-silver-copper alloy, treated with approximately 0.20 per cent indium, were run for over 5000 miles at high speed. At the conclusion of the test these bearings showed only slight evidence of etching, whereas untreated bearings run in one of the connecting rods were replaced three times because of their badly corroded condition. The acid number of the oil used reached a value of 3.3.

In another engine the fatigue life of babbitt-lined bearings ranged up to a maximum of about 60 hr. under the severe conditions used for testing (4250 r.p.m., full throttle, with oil temperature 250 deg. to 260 deg. F. at the bearings). Cadmium-silver-copper bearings treated with 0.4 to 0.5 per cent indium run under these test conditions, and in the presence of oil containing 0.5 per cent of oleic acid, were in excellent condition after 120 hr., showing no evidence of corrosion and very slight indication of fatigue cracks.

Such tests on bearings, in engines run at high speed and with corrosive oils (see Fig. 3), verify the information obtained from laboratory tests—namely, that the indium treatment as described prevented corrosion of the cadmium-alloy bearings without impairing the fatigue resistance or other bearing-metal properties.

Influence of

Basis Metal on the Plate

By ADOLPH BREGMAN
Consulting Engineer, New York

THE plate copies the structure of the underlying metal. Impurities, irregularities and other imperfections reduce the quality of the deposit. All this is described herein, as are also the standards of quality for basis metals.

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THROUGHOUT the history of the metal finishing industry most of the effort and energy expended on the improvement of the art has been concentrated on the finish itself. Imperfections, faulty work and rejections have always been attributed to the finish or the finisher. Only in recent years has it been borne in upon metal products manufacturers and producers that the condition and quality of the finish are vitally affected by that once neglected factor—the basis metal.

Although the earliest recognition of this fact probably came from practical finishing department operations where it was found that a "good" metal (i. e. a smooth, uniform, nonporous metal) took a "good" plate or other finish, scientific workers have for some time been aware of the influence of the basis metal.

Fundamental Considerations

It was first noted by Huntington[1] that the microstructure of a copper deposit can be influenced by that of the copper upon which it is deposited. Blum and Rawdon,[2] and Graham[3] showed that the microstructure of cast or annealed copper can be continued by a copper deposit prepared under conditions which favor the formation of a coarsely crystalline deposit. Blum and Rawdon pointed out that the orientation of the copper base, as indicated by etching figures, is copied by the deposit.

Hothersall[4] found clear evidence of the continuation of microstructure of the basis metal by the deposit in the electrodeposition of copper on copper, nickel, silver and copper-zinc alloys. Also, with nickel and tin on copper, the macrostructure of the deposit was clearly a reproduction of the basis metal. The continuation of a basis metal structure, Hothersall concluded, is possible (a) when the deposit and the basis metal belong to the same crystal system over a range of differences in lattice parameter (from —2.4 to +12.5 per cent difference); (b) when deposit and basis metal belong to different systems.

It also appeared probable that the high degree of adhesion obtainable with electrodeposited coatings is associated with their ability, in some cases at least, to continue the crystal lattice of the metal upon which they are deposited, if only over a limited thickness.

In Portevin and Cymboliste's[5] "Contribution to the Experimental Study of Electrolytic Deposits Obtained in Aqueous Solutions," they found that the fine structure of electrodeposits may be influenced by the crystallization of the cathode, and especially the number of crystals per unit of surface of the cathode. To be sure, other conditions, such as the composition of solution, current density, temperature, etc., affect the structure of the deposits. However, the structure of the basis metal or cathode is one of the important factors.

Nickel plate on electropolished 18:8 stainless steel shows a continuation of the crystal structure, while on mechanically polished 18:8 stainless steel, it shows no ordinary structure. Electron diffraction studies show, however, that the diffraction patterns of mechanically and electrolytically polished 18:8 stainless steel are the same.[6]

Finch and Sun some time ago stated the case briefly,[7] although perhaps too broadly. "It has been found that the structure of the sub-

[1] Transactions Faraday Society 1905, Vol. 1, p. 324.
[2] Transactions American Electrochemical Society, 1923, Vol. 44, p. 305.
[3] Transactions American Electrochemical Society, 1923, Vol. 44, p. 427.
[4] Influence of the Basis Metal on the Structure of Electrodeposits. The Structure of Metallic Coatings, Films, and Surfaces; published for the Faraday Society by Gurney and Jackson, London, 1935, pp. 1242-47.
[5] Structure of Metallic Coatings, Films and Surfaces; published for the Faraday Society by Gurney and Jackson, London, 1935, pp. 1211-1218.
[6] H. Pray and C. L. Faust, THE IRON AGE, Apr. 11, 1940.
[7] An Electro-Diffraction Study of the Structure of Electrodeposited Metals, by G. I. Finch and C. H. Sun. Transactions Faraday Society, Vol. 23, 1936, pp. 852-863.

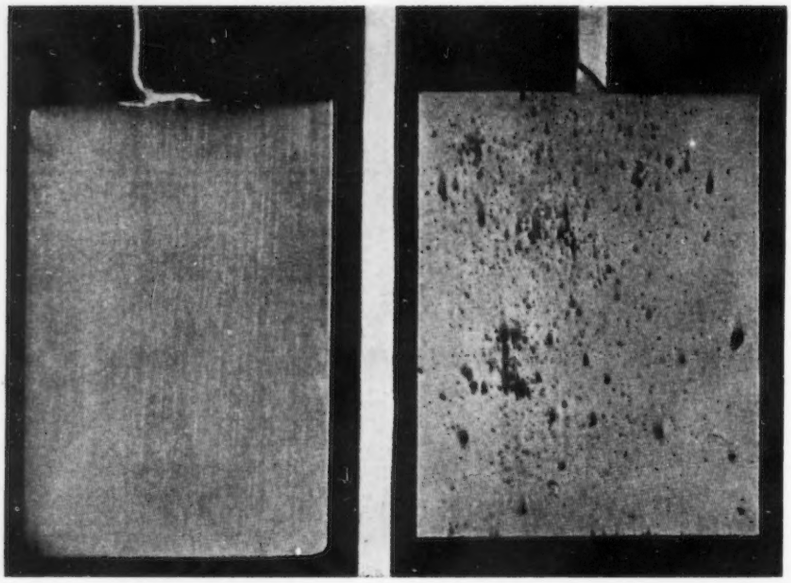


FIG. 1—Effect of basis metal upon porosity. Nickel deposits 0.00012 in. thick after hot water test. On left, electrolytic iron (no pores); on right, finished black plate. Photos courtesy Electrochemical Society.

strata upon which a metal is electrodeposited nearly always profoundly affects that of the deposit, in that the orientation of the substrate crystals determines that of the deposit."

The smoothness of the basis metal surface has been shown to be a vital factor. Hothersall[8] found that electrodeposited nickel adhered more firmly to a buffed brass surface than to a brass which had been similarly buffed and then roughened with emery. In investigating the causes of porosity of plated coatings, Hothersall and Hammond[9] found that a rough condition of the surface, as well as foreign matter in the surface of the steel, were the most important causes of porosity in nickel deposits formed on steel.

Polishing of the steel on revolving wheels dressed with polishing compositions, bonded with grease, resulted in increased porosity of the nickel deposit, due to inclusion of foreign matter in the surface. Porosity (which they defined as "the presence of microscopic channels extending through the coating to the basis metal") may also be derived from loose particles on the cathode or work surface. These loose particles may result from the dissolution of metals by chemical or electrochemical means, as in etching. Small particles of metal or non-metallic impurities, such as carbides in steel, resulting in "carbon smut," are frequently loosened from the surfaces. The constituents of the basis metal may also be attacked, during anodic etching, with the formation of non-conducting particles; for example, silica, tungstic oxide, etc. Some of these particles may remain attached to the surface and will function like suspended particles in the solution which settle on the cathode surface, causing the formation of growths, or acting as nuclei for the local discharge of hydrogen gas, which will prevent nickel deposition by the shielding action of the bubbles.[10]

In addition to its effect on hydrogen overvoltage and also on the number of gas pockets, surface roughness may be an important cause of porosity because of the failure of the deposit to cover the bases of pits and the fissures in the metal, especially in solutions of comparatively low throwing power. Also, pits may be formed in steel surfaces by local rusting, and even if the rust is removed in cleaning, the minute pits may remain.

In attempting to produce thin, non-porous nickel deposits, variable results were obtained due to the differences in the surface of the steel sheets used. By the use of prepared electrolytic iron sheet of high purity as the cathode, it was found possible to deposit nickel 0.00006 in. in thickness, in a non-porous condition, whereas even double this thickness showed a high degree of porosity on the bright rolled mild steel. (See Fig. 1.) The authors considered it probable that further refinements in technique, particularly in the production of electrolytic iron with a very smooth surface, would make it possible to produce even thinner coatings in a non-porous condition.

The authors roughened the surfaces of machined bright rolled mild steel bars along half their length and then nickel plated the bars over their full length. Porosity tests showed the roughened half to be much more porous than the smooth half. (See Fig. 2.) These bars were so improved by machining away a few hundredths of an inch by a light cut with a sharp tool and afterwards smoothing in a lathe by light pressure with a smooth file, that results were obtained very close to those of electrolytic iron.

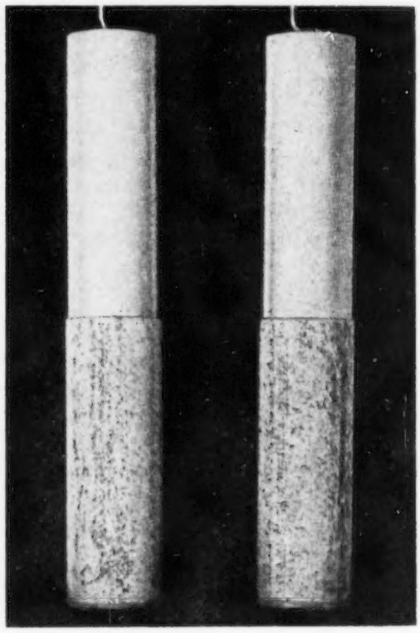


FIG. 2 — Reduction in porosity of nickel deposits, 0.00006 in. thick, produced by machining bright rolled mild steel bar. Courtesy Electrochemical Society.

The important improvement produced by machining was the formation of a smooth surface and the removal of surface inclusions — rust, grease and other foreign matter contained in crevices and difficult to remove by ordinary cleaning methods. Micro-examinations of the deposit on machined and bright rolled surfaces, showed the presence of inclusions in the bright

[8] Transactions Electrodepositors' Technical Society, May, 1932.

[9] Causes of Porosity in Electrodeposited Coatings, Especially of Nickel on Steel; transactions, Electrochemical Society, 1938, pp. 171-196.

[10] Particles of metallics and carbon, etc., from the anodes, and dust particles from the atmosphere will have the same effect.

[11] The benefits of heavier coatings in reducing porosity have been fully described in the "Summary of Exposure Tests of Plating on Steel and Non-Ferrous Metals," of the National Bureau of Standards, March 1, 1939; also the Fifth Progress Report of the American Silver Producers Research Project, Mar. 1, 1938, p. 20a.

rolled surfaces, which were also considerably more uneven than the machined surfaces. Both the inclusions and the roughness may have been responsible for the greater porosity of the bright rolled surfaces.

The importance of roughness as a cause of porosity was also shown by the invariable occurrence of pores on the sheared edges of the electrolytic iron sheets after nickel plating, even though the faces were free from pores. This tendency was considerably reduced or even eliminated by careful smoothing of the sheared edges with a file.

In plating bright rolled bars with parts machined away as described above, it was found that the thickest coating was practically non-porous on the polished specimen, but highly porous on the roughened specimen, the pores being located on the scratches. Some pieces were sand-blasted and plated and a very marked concentration of pores was found in the sand-blasted area, probably due to particles of sand which had become embedded in the surface.

TWENTY-THIRD in a Series of Articles on the Technical and Economic Aspects of Metal Cleaning and Finishing

The conclusions were that in the case of the roughened bars the porosity of the coating was due to the inability of the nickel to deposit at the bases of the pits and fissures in the metal. It might, therefore, be expected that plating with a solution of better throwing power would result in lower porosity, and that increasing the thickness of the coating, with resultant bridging over the pits and fissures would have the same effect.[11]

It was found also that hydrogen gas bubbles were more freely discharged from rough surfaces than from the smooth surfaces, because of the lower hydrogen overvoltage and because the electrolyte was excluded by the presence of trapped gas.

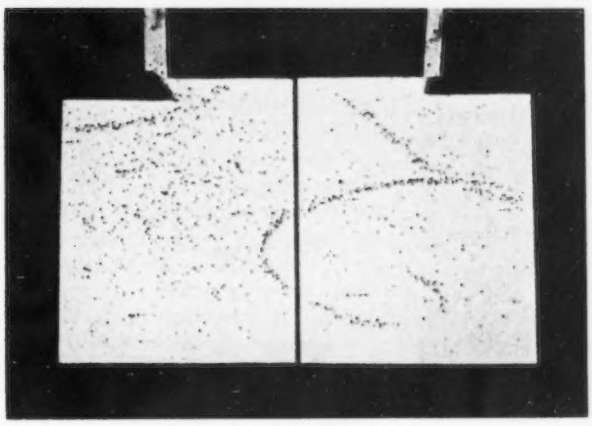
Polished sheet steel did not give deposits better than the unpolished, bright rolled sheets. The polished areas seemed somewhat more porous than the unpolished areas. The conclusion of the authors was that the crevices had become filled with the polishing matter which interfered with proper coating. If the surfaces were not etched before plating, the porosity was not so evident, due to the flowing of the metal over the fissures during polishing, thus covering them. The etching removed this thin flowed-over layer of metal and exposed the fissures filled with polishing compound.

The important effect which may be produced by foreign matter in the surface of the metal was also demonstrated by the reproduction by pores in the nickel deposit, of figures which had been originally chalked on the surface during rolling. (See Fig. 3.)

In removing rust from parts to be plated, it appeared that prolonged etching was more successful than pumice scouring. After pumice scouring, the particles of rust remaining at the base of minute pits were responsible for the pores in the coating.

In general, Hothersall and Hammond concluded that porosity in nickel deposits is caused chiefly by: (1) the presence of inclusions of non-conducting of poorly conductive areas of one sort or another in the surface of the basis metal; (2) the shielding action of gas bubbles or of particles of solid matter derived, among other ways, by loosening from the basis metal; (3) the failure of the deposit to cover the surfaces of crevices in the rough basis metal; (4) the inclusion of grease or polishing composition in crevices over which a thin skin of metal (dissolved away in etching prior to plating) is flowed during polishing.

An interesting side-light on the ef-



ABOVE

FIG. 3—Localized porosity at the site of mark chalked on sheet during manufacture. Courtesy Electrochemical Society.

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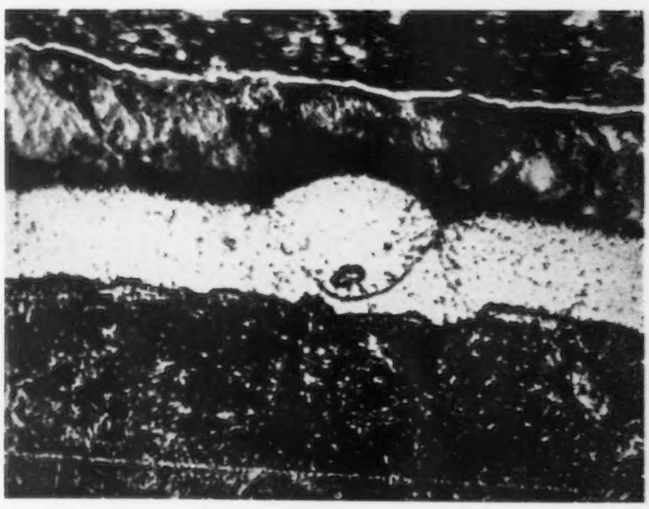

RIGHT

FIG. 4—Section of a plate containing a foreign particle inclusion. Crystals may be seen growing normal to the particle surface and the interference caused by neighboring crystals results in a continuous semi-circular crystal boundary. Such a nodule may be completely pulled out during buffing. Courtesy Electroplaters' Society

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FIG. 5—Hydrogen evolving from a 1/8 in. steel wire placed in previously boiled water at 95 deg. C. (200 deg. F.) after 10 min. pickling in warm dilute sulphuric acid. Thirty seconds after immersing (left), 5 min. after immersing (middle), and 10 min. after immersing (right). Note the large volumes of gas. Courtesy of American Electroplaters' Society.

o o o

fect of roughened surfaces is the fact that the adherence of silver, nickel and copper to lead was lowered when the surfaces were scratch-brushed before plating, to remove the discoloration produced in the cleaning procedure.[12]

In his work on the "Effect of Polishing on Corrosion Resistance," W. M. Phillips[13] investigated the effect of polishing on the resistance to corrosion of electroplates of copper and nickel on steel, comparing unpolished cold rolled auto body sheet of good quality with some sheets polished with various sizes of abrasive grain and some sheets buffed with white chromium compound, but without grain polishing. The grades of emery used were Nos. 46, 80, 120, 180 and 240. The wheels used were of felt and set up with hide glue. One group of samples was plated with copper to a thickness of 0.0005 in., nickel 0.0005 in., and then chromium plated. Another group was coated with nickel 0.001 in. and chromium plated. All of the samples were tested in the salt spray, using equipment of the Navy type, carefully baffled.

The conclusions drawn were the following:

(1) The pieces not polished with any grain stood up better than the grain polished sheets.

(2) The type of failure with the coarse grits Nos. 46, 80 and 120 was different from those polished with the fine types, Nos. 180 and 240. The failure of the coarse polishes was of the closely-cropped, fine pinhole type, while those polished with the fine grades showed failure or rust spots from large holes or pores which seemed to come from holes in the base metal.

(3) The panels finished with chromium buffing compound were distinctly better than those polished with the grain, and indicated the desirability of plating on highly finished sheets.

(4) The best results obtained were with no polishing wheels at all, but just a buffing wheel.

From these experiments, the conclusion might be drawn that it would be best to eliminate polishing as far as possible; in other words, to get as highly finished a steel as possible and then carry out the fabrication, press work, etc., in such a way that it would not be necessary to polish the steel with coarser grades of emery. Grease wheels with finer grades of emery are a step in the right direction. Phillips has also noted[14] the indication was that there was some skin effect on the surface of the metal, which, if it could be left substantially alone, would produce better results than if it were removed. However, he points out that this practice is not always possible, since it is often necessary to draw the steel and in so doing, inevitably to produce some die scratches which have to be polished out.

This last statement introduces a seeming contradiction, since it will be remembered that Hothersall and Hammond, when plating bright rolled mild steel bars, found that removal of the skin by machining decreased the porosity of the deposits. However, two different factors are involved. In Phillips' statement the condition of the basis metal is considered from the standpoint of inclusions while Hothersall's and Hammond's results were obtained without inclusions and the variations were due to roughness of the surface, in the fissures and pits of which the nickel would not deposit.

Pinner[15] corroborated the conclusion of other investigators, that the polish on steel does have a real effect on the character and corrosion resistance of nickel plate; also that pores, scales and similar imperfections in the basis metal, exert a profound influence on the properties of the plate. (See Fig. 4.)

Something else besides scratch depth enters into the picture. There are indications that some relation exists between corrosion resistance of the plate and the scratch shape or width, and within certain limits, that corrosion resistance may be independent of depth of the scratch. It may be that no polish at all on a good cold rolled finish is better than a polished finish. The very high finishes on steel give superior results and nickel deposited on buffed copper also gives superior corrosion resistance. The corrosion resistance of nickel over sand-blasted steel is poor.

An interesting suggestion made by Pinner was that poor scratch appearance need not necessarily mean poor corrosion resistance. It is possible that scratch elimination is not absolutely necessary as long as a smooth effect is obtained on the scratch tops combined with some diminution of scratch depth and width.

Another aspect of the basis metal has a vital bearing on the subsequent coating, namely, the quantity of hydrogen which it contains as a result of pickling, descaling, etc., in steel mill operations. According to Zapffe and Faust[16] hydrogen exerts a tremendous effect on deposited metals. Lifting, blistering, poor adhesion, etc., may be caused by this gas through its effusion

[12] F. C. Mesle, Proceedings—American Electroplaters' Society, 1939, pp. 152-168.

[13] Proceedings—American Electroplaters' Society, 1936, p. 249.

[14] W. Phillips, Private Communication.

[15] A short research on the effect of basis metal polishing on the character of nickel plate, Transaction American Electroplaters' Society, 1940.

[16] Metallurgical Aspects of Hydrogen in Electroplating, Transactions American Electroplaters' Society, 1940.

[17] Bulletin of the New Jersey Zinc Co., The Finishing of Zinc Alloy Die Castings and Rolled Zinc, 1934, p. 7.

from the steel base at ordinary temperatures, and even more so during heating. The effusion of gas from the cathode during electroplating is the cause of gas pits. Hydrogen absorption is very severe during cathodic cleaning, in either acid or alkaline solutions, as in descaling. The steel absorbs huge quantities of hydrogen, presented atomically at its surface, during pickling and cathodic electrolysis, causing important effusions of this gas when the atomic layer is removed by the presence of an applied coating. When this effusion occurs under a coating of any material, such as an electroplate whose permeability is unsuited to the quantity of the effusion, the coating may be lifted from the steel, ruptured or blistered. If the plated part is at any time heated, the effusion of hydrogen is accelerated and the coating is weakened. (See Fig. 5.)

Another type of base metal in which the condition of the surface is of utmost importance is zinc base die casting alloy. Because the zinc base die casting has a dense skin and a more porous body, polishing or grinding should be avoided as far as possible to avoid cutting through the skin and exposing the pores.[17]

Normally, the surface is excellent for plating, but the removal of fins by grinding and the necessity for buffing certain portions, results in the formation of two different types of surfaces. Consequently, since the cleaning of zinc base alloys to prepare them for plating is an extremely delicate and careful operation, troubles occur, as the cleaner may be suitable for one or the other (the buffed or the unbuffed) surface. Here there is again the need for providing for uniform characteristics in the metal as fabricated: high purity and absence of blow holes, flow marks, run marks, etc. Moreover, the surface must be cleaned with a very mild alkaline cleaner to prevent "overcleaning" and consequent blistering of plates.

Ed. Note:—Next week the author concludes this article with a description of the practical manufacturing operations to prepare a metal surface for plating.

Flo-Met'l Used to Protect Metal Surfaces

AN interfacial alloy coating with lead base and with very small percentages of other metals is being displayed by Flo-Met'l, Inc., Boulevard Bldg., Detroit. It is said that the corrosion resistance of the coating is very high to salt spray, hydrochloric hydroflouric, and even nitric acid.

The claim is that the coating does not peel back if corrosion or rust is introduced at one point. Its resistance does not depend on the thickness of the coating, but is determined by the existence of an interfacial alloy. The interfacial alloy is formed with steel; has been evidenced with brass and cast iron; and, with copper a close bond, without interfacial alloy, exists.

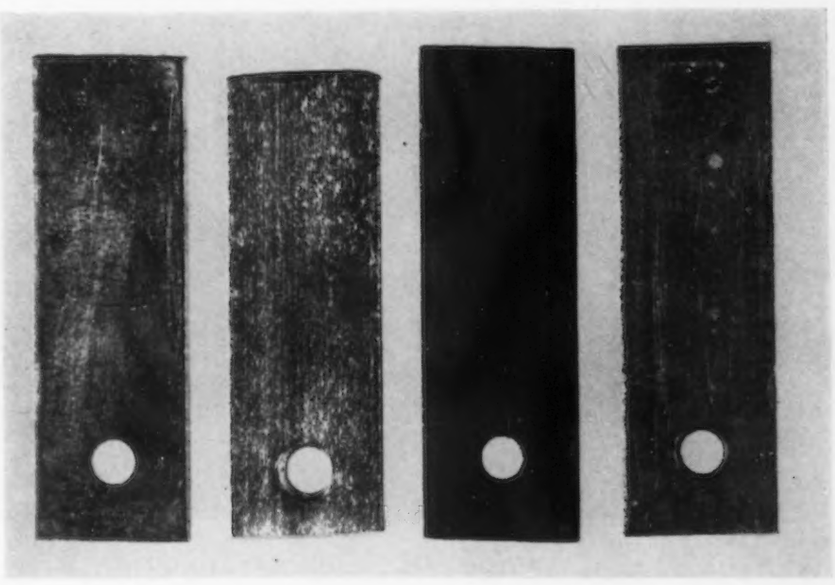
Typical parts to which the coating has been applied are bolts, stays, rivets, washers, for marine use; exhaust system parts for automobiles; gas masks and breathing apparatus; electrical connections; battery terminals; pipe and tubing; wire; pipe and pipe fittings; stampings.

Although not intended for decorative purposes, Flo-Met'l has a bright finish. Also, it has an exceptionally low surface tension and flows readily into and through apertures, chambers and screens without plugging holes.

Applied by conventional cleaning and hot dipping methods, it has a melting point of 480 deg. F. and a dipping temperature of approximately 575 deg. F.

The samples shown in the accompanying photograph are test strips of ordinary cold rolled steel.

A has been cleaned and hot dipped in the conventional manner. B is the same kind of a test strip, severely etched with acid. It shows how the low surface tension of the coating material allows Flo-Met'l to follow the contours of the steel surface. C is a similar piece coated with Flo-Met'l and then placed in an oxidizing heat treating furnace at 1525 deg. F. for 10 min. The oxidized appearance of the specimen is apparent but in D, a piece treated similarly at the same time, shows the appearance after cleaning with steel wool; the coating of Flo-Met'l is still intact. After this test the interfacial layer remained, as indicated by the fact that it did not peel when corrosion was started purposely on one point.



Flame Hardening Cast

WITH the advent of flame hardening by the oxy-acetylene torch, rapid steps have been made in the surface hardening of cast iron and steel* whereby a hardened surface is produced without distortion and at the same time retaining the soft core properties with its high shock resistance and ductility.

Cast iron with suitable chemistry to enable such a procedure must be used. An excellent analysis is as follows: Graphitic carbon, 2.00 to 2.50 per cent; combined carbon, 0.50 to 0.80 per cent; manganese, 0.70 to 0.90 per cent; silicon, 1.50 maximum.

*For detailed description of flame hardening practice see THE IRON AGE, issues of Oct. 17, 24, 31, and Nov. 7 and 14, 1940.

Molybdenum or chromium may also be used as alloying agents. In the case of molybdenum in quantities 0.25 to 1.25 per cent, it retards the critical transformations in both the liquid and solid state. This in itself limits volume changes and thus allows for less tolerance on machined parts, which parts must be ground for final finish. Some investigators believe molybdenum has a tendency to cause graphite flakes to take on a somewhat nodular form and thus produce an iron of improved physical properties.

With combined carbon in the above range (0.50 to 0.80), it is also possible to produce a hardened structure containing considerable cementite.

In order to prove the above, several hundred bearing rings were cast out of the above analysis with molybdenum 0.25 per cent.

Fig. 1 shows the rings machined ready for hardening. Surface A represents the area to be hardened. Grinding tolerance after hardening is 0.010 in.

A permanent fixture, as shown in Fig. 2, was built with a table on top for the torch to travel on and centered rings inside the box to hold the castings in exact position. The water

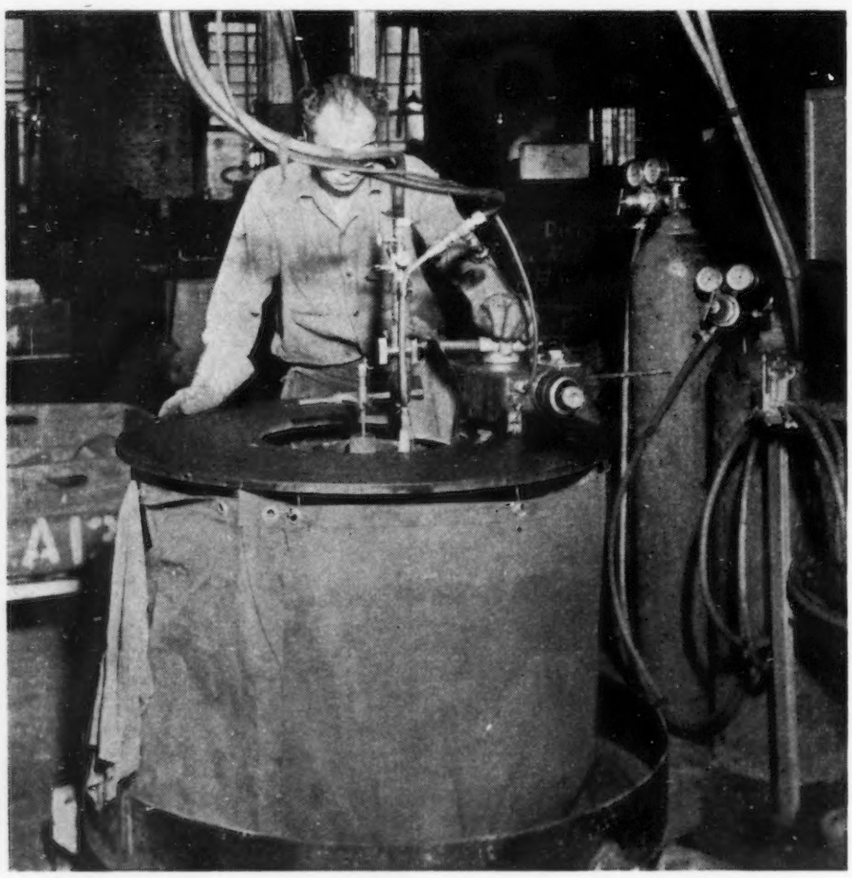


FIG. 2—Equipment used for flame hardening the bearing rings.

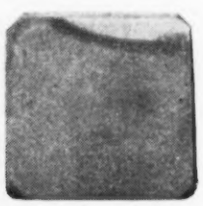


FIG. 3 — Hardness pattern obtained in a thrust ring.

o o o

FIG. 4 — Hardness pattern obtained in a center ring.

Iron Bearing Rings

By J. L. Foster
Metallurgist, Austin-Western Road Machinery Co., Aurora, Ill.

quench is attached to the torch and follows it at ¼ in. distant.

The speed of travel of torch is governed by the small control wheel at the rear of the cutting machine. This speed is determined by the depth of penetration desired on the piece. In the case of these rings the diameter was 9 11/16 in., and approximately 4 min. were consumed in making the complete revolution.

Figs. 4 and 5 show the hardness pattern obtained on the three types of rings. In each case the depth of patterns is ⅛ in. Hardness readings on the hardness area range Rockwell C-54-58.

Fig. 3 is a thrust ring on the outside of the two bearings and the ring represented in Fig. 4 is a center ring between two roller bearings. Photomicrographs were taken of the two structures, and are shown in Fig. 5. The hardened area is cementitic in structure while the core area is pearlitic.

As previously mentioned, it is thought that molybdenum has a tendency to nodulize the graphite flakes. This does not appear to be true in this case where only 0.25 per cent is used. In this quantity, however, there is no doubt it adds to the hardenability since it forms complex carbides in the solid ferrite solution.

After these rings are hardened, they are face ground, removing about 0.010 in. to a mirror finish. There is no grinding on the outside diameter.

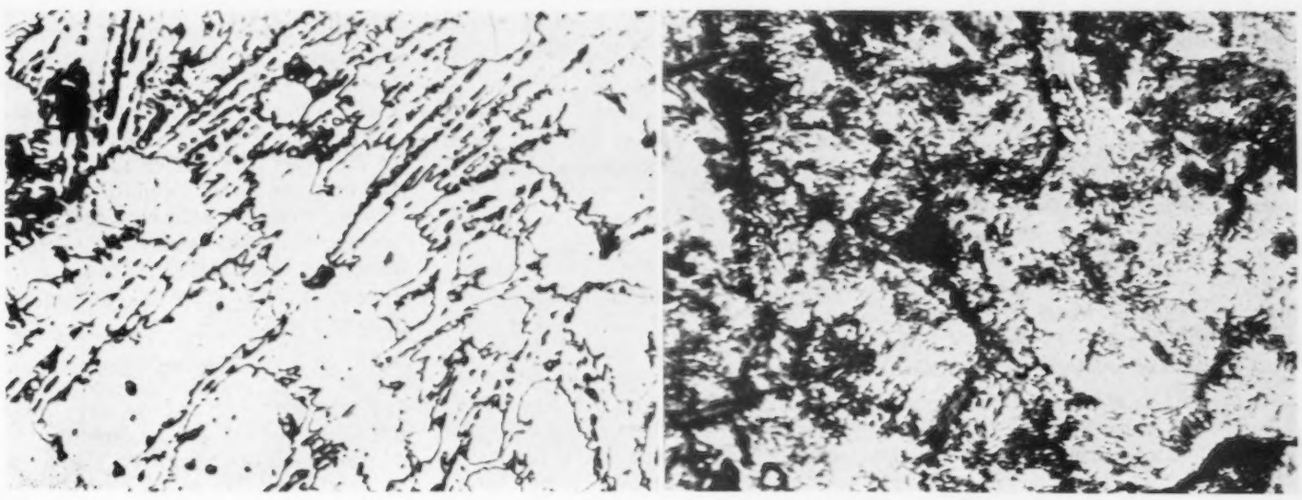
In hardening there is no out-of-round distortion in the ring.

ABOVE

FIG. 1—Rings machined ready for hardening. Surface A represents the area to be hardened.

BELOW

FIG. 5—(Left) Hardened area; (right) core area. Both etched in 4 per cent picric acid, and at 300 diameters.



Welding Sheet Copper

IT is a somewhat surprising fact that sheet copper is still being fabricated by brazing, riveting, etc., almost to the exclusion of welding. For oxy-acetylene welded joints in copper are far superior to those obtained by the older methods, and are equal in strength to the original metal, possessing all the characteristics of copper, according to A. J. T. Eyles, in a recent issue of *Sheet Metal Industries.*

In welding sheet copper, certain precautions are necessary since the metal has a great affinity for oxygen, and, when molten, for hydrogen. In the case of molten copper, the oxide is absorbed in the metal. Upon cooling, part of the oxide re-forms with detrimental effect on the strength of the metal. Also, in the event of gases being absorbed during the welding operation, these gases will surely be evolved as the metal cools, making the weld weak.

For successful welding, it is desirable to use suitable deoxidizers, incorporated in the welding rod, and deoxidized copper sheets whenever possible. Deoxidizers tend to prevent absorption of gases by the metal during welding, slightly lower the melting point (usually up to 15 deg. C.), and also reduce the oxide as it is formed.

A suitable flux, consisting of a combination of borates, should also be employed in order to clean the metal chemically of superficial impurities. This flux should not be used in large quantities, and is best applied by dipping the end of the heated welding rod into the flux. Another method of applying the flux is in paste form. The welding powder is mixed with clean water to give pastes of a cream-like consistency, which is applied with a small bristle brush on either side of the seam for a width of ½ to ¾ in.

Ordinary commercial copper sheet is not so satisfactory as deoxidized copper for weld joints. Ordinary commercial copper contains a certain amount of oxide. No matter what precautions are taken in providing deoxidizers, such as phosphorus, silicon, etc., in the welding rod, this does not counteract the detrimental effect of the oxide already present in the parent metal.

Preparation of Edges

When welds are made in ordinary copper sheet, the actual weld metal itself may be perfect and free from porosity, etc. Microscopic examination, however, will prove that the metal at the boundary of the weld recrystallizes when cooling, and any oxide present collects at the crystal boundaries, weakening them, and therefore the weld. By using completely deoxidized copper sheet, the difficulties mentioned are entirely overcome. Deoxidized copper has undergone special treatment to eliminate the oxide. This "deoxidized" copper is obtainable from most manufacturers of copper as promptly as ordinary commercial copper sheet and generally at no increased cost. In ordering, it is well to specify "copper completely deoxidized with silicon." It should contain from 0.05 to 0.15 per cent of silicon, to allow for loss during welding.

In preparing the copper sheet, it is first necessary that the edges of the sheet and the metal near the welds should be absolutely clean. Scale, grease, and other foreign matter will make the weld metal porous and spongy, and may prevent it from filling all parts of the weld, causing cavities or blowholes, and seriously reducing the strength of the joint. There are various methods of cleaning, the essential point being to remove all impurities from the vicinity of the weld as completely as possible.

In welding sheets or sections 1/16-in. thick and under the edges should be flanged to an angle of 90 deg. to a depth of one to one-and-a-half times the thickness of the metal, varying with the thickness. With this method, the welding rod is unnecessary, the flanged edges fusing and providing the necessary material for the weld. The bends of the flanged edges should be adjusted so that they touch exactly. Sometimes it is advisable to tack weld the edges of the flanges at intervals of from 6 in. to 8 in. before melting down the whole flange. In making flange welds it is desirable to secure complete penetration to the bottom, to insure a good weld, and to eliminate the oxide film that is likely to exist between the flanged metal edges.

When copper sheets or sections are from 1/16 in. to ⅛ in. thick, it is preferable simply to butt the edges together. Another important part of the work prior to the actual welding is the method adopted for keeping the sheet edges in the proper position relative to one another instead of overlapping due to the large expansion of the metal on heating. A number of factors influence the allowance for spacing the sheets prior to welding, such as the thickness of the copper, the dimensions of the sheet, the size of the blowpipe tip used, and the speed of welding. Stouter material will require greater spacing than thinner sheet. The longer the seam the greater the amount of spacing that must be allowed at the finishing end.

Spacing

For copper sheets of the same thickness, the spacing will be directly proportional to the length of the seam. A speedy welding operator will make

an allowance considerably less than that made by a slower operator. The slower welder allows the greater amount of heat to be impinged in the seam, which causes a greater movement of the sheets. The average practise is to set the edges out of parallel about ¼ in. to the foot. Thus a seam 6 ft. long should be tacked close together at one end; while at the other end the edges stand apart 1½ in. On repetitive work, a few trials will quickly show whether or not the first spacing allowances are correct, and adjustments can be made based upon the actual working conditions under which the welding is being done.

When copper sheets are above ⅛ in. in thickness, each edge should be beveled to an angle of 45 deg. The bottom edges should be set about 3/64-in. apart. In production welding and repair work, various jigs and fixtures can be devised to hold the metal carefully in place. The judicious use of jigs, often of the simplest design, will make it possible to overcome distortion in the finished product. Preparation of the work is very important, since it will keep the cost of welding low.

Good copper welds can be obtained only if the blowpipe will constantly maintain a neutral flame; therefore, the blowpipe must be designed and constructed so that the acetylene and oxygen will be delivered at constant pressure and quantity. The blowpipe should be manipulated in a vertical direction, so that the molten copper and the adjacent areas are protected by the outer enveloping cone of the flame. This procedure prevents oxidation, and if the flame is truly neutral it will minimize the absorption of gases from the flame. For copper sheets over 1/16-in. thick, the familiar swinging motion used in steel sheet welding should be employed. This motion should be restricted, however, within as narrow limits as possible. A competent welder can secure a good ripple seam in copper like that secured in sheet steel.

Copper melts at a temperature of about 1083 deg. C. (1981 deg. F.), and less concentration of heat is required than for welding steel. Asbestos sheet or other suitable insulating material may advantageously be used under the weld joint or seam. Pre-heating is necessary when welding large copper sections or thick sheet, and is desirable in order to save gas and reduce the time in actual welding.

Finishing

Copper sheet welding requires promptness in execution and should be continuous, taking care to secure a complete union between the sheet edges. Once a section is welded, the operator should not go over it again. A mistake to which many inexperienced welders are prone is to weld over a finished joint or seam with the purpose of producing a good and uniform appearance of the weld; but this is not to be recommended, since it often produces a fractured joint or seam. The surface of the weld metal should be built slightly above the surface of the sheet, so that the welded joint or seam can be hammered flush with the sheet surface.

Cold Hammering

A welded copper joint is composed of cast copper, and therefore has the strength only of cast copper, but its tenacity can be increased by cold hammering over the area of the weld. After the hammering operation, annealing is desirable, as it improves the ductility and enables the weld to be more readily worked by bending, drawing, etc. A suitable annealing temperature is 650 deg. C. (a dull red heat). This treatment relieves the strains often set up within the metal during the welding operation, and tends to restore homogeneity of structure. When correct methods and precautions are applied and observed, copper fusion welds are equal in strength and quality to the original metal. After a copper sheet weld has been hammered and polished, the weld joint is practically invisible.

Experience proves that the key to successful application of the welding process to copper lies in the quality of the joints. Permanent tightness, strength and ductility are the qualities that are generally most needed where copper sheets are to be joined. In addition, the joints offer high resistance to corrosion, erosion, and galvanic action, as no heterogeneous metal is deposited in the weld joint. Moreover, the weight of a sheet copper product can be reduced by eliminating the lap or grooved seam and the additional metal of rivets in seams or joints.

Photoelectric Width Gage for Moving Strip

A NEW photoelectric gage which gives a continuous and accurate indication of variations in the width of moving steel strip without making contact with the metal has been announced by General Electric.

With the new device, the width of the strip can be measured "on the fly" at any point or points in the mill and variations from the required width can be accurately transmitted to any number of desired stations such as the control pulpit, etc. Thus while the strip is moving through the mill, adjustments to the edging rolls can be readily made by the operator to correct deviations from normal width.

This continuous method of measurement is in sharp contrast to the practice where the width is checked after the strip is delivered in coils from the coilers. By the time this manual checking is accomplished, several other slabs are in the process of being rolled and on these no correction for width can be made. Obviously, under-gage material means possible rejection while strip excessively wide might have to be side-trimmed. Thus, it is believed that the continuous indication offered by the new photoelectric gage should make possible substantial savings in time and material.

Although the gage was developed primarily for use on hot strip mills, it can be readily applied to many other industrial jobs involving width control of moving strips of material.

In operation, both edges of the strip are followed simultaneously by narrow light beams and true indication of its width is given regardless of any sidewise movement of the strip. The movements of the light beams are photoelectrically transmitted to indicating instruments.

Brass Die Casting

—Die practice and operating technique as used by a Pacific Coast plant

By HERBERT CHASE

° ° °

CONSIDERABLE progress is being made in the die casting of brass by the Los Angeles Die Casting Co., despite the need for keeping die cost at a minimum where only moderate quantities are commonly required. Brass die castings produced in this plant, said to be the first to make this type of casting on the Pacific Coast, are made in three vertical plunger machines of original design. These machines are of the cold chamber type*, in which molten or semi-molten metal is ladled into the chamber before it is forced into the die by a hydraulically operated plunger, and are capable of applying to the metal pressures of 30,000 lb. per sq. in. This pressure insures dense castings, and the machines are capable of averaging around 1200 "shots" (die fillings) per 8-hr. day. The same machines are being used also for some aluminum die castings, but die castings in zinc alloy, made in much the largest volume in this as in most die casting plants, are produced on another type of machine.

Success in the production of brass die castings depends in part upon the use of dies capable of resisting for a reasonable period the rather high temperatures at which the metal must be cast without heat checking excessively. To date, this plant has used an imported alloy steel of which it has a considerable supply on hand. The quantity of this steel, which is quite high in cost, used per die is kept as low as possible by forming only the cavity blocks from it and then fitting them into cast iron or other low cost chases with which the metal cast does not come in contact. Die cavities usually require repolishing after 3000 to 4000 shots if a die casting having a truly smooth finish is required, but allowances are made for this and customers are informed when the die is made that some dimensional changes in castings may be expected, because of the polishing, when it becomes necessary. It is considered feasible to make a die, that is, to justify the required investment, even when as few as 1000 castings per run are required, provided some three or four repeat orders a year are anticipated. In some cases, there are possible economies in even shorter runs, since, as indicated later, the savings over other methods of production usually are considerable. As compared with sand

* See THE IRON AGE, Nov. 28, for description of cold chamber practice on Mg and Al alloys.

FIG. 1—Four die castings in brass. Right center is a flanged valve body, at right is a bushing having two inside and two outside diameters, at left is a holder for a tumbler and toothbrushes, and at left center is a crank handle with steel insert, used in a soap dispenser.

castings, the brass die casting can often be made much lighter or of about double the strength for a given section thickness, hence there are economies in metal as well as marked savings in machining costs.

Fairly typical of what has been done is the valve body shown in Fig. 1. Section thickness in most parts of this casting runs from 1/16 to 3/32 in. There are cores at both ends and at the back and the casting weighs about 5 oz., as against 12 oz. for the sand casting formerly used. Although the price per casting is the same as for the sand casting, the latter required so much machine work that the net cost of the finished piece is about 50 per cent lower in the die casting, which also is very smooth and is very attractive when plated. Along the front of this casting there is a cored recess, only a few thousandths of an inch deep, for a stripe of colored paint, which also improves the appearance. Although this piece requires a die with two hydraulic core pulls, die cost was held below $225.

The bushing shown in Fig. 2, now die cast in red brass, was formerly made as a forging, with a hex on the smaller of the two outer diameters. Change to the die casting was made because the hole, which is later tapped with a 24-pitch thread, could be held within closer dimensions, namely, plus or minus 0.003 in. of size desired.

Even on parts usually made on the screw machine, partly because all surfaces are surfaces of rotation, the brass die casting can sometimes show a saving, as on the bushing shown in Fig. 1, which has two outside and two inside diameters. In this case, the maximum O.D. is 1½ in. and the minimum I.D. 1 in. This bushing, as delivered by the die caster, weighs less than 2 oz., but when turned from brass rod took 8½ oz. gross metal per piece. Sale of scrap paid the cost of machine work only on the part produced by

FIG. 2—This bushing, die cast in red brass, takes the place of a part formerly forged from similar material.

screw machine, but metal cost alone ran the cost of the piece to the customer to nearly double the cost of the die casting. This bushing was die cast in a low cost, three-cavity die, run at 1200 to 1400 shots per 8 hr., or a total of about 4000 bushings a day.

Flat parts, such as the combination tumbler and tooth-brush holder shown in Fig. 1, are readily die cast with the holes cored to size and in a finish so smooth that a minimum of polishing is needed to prepare them for plating. If forged, the holes would be difficult if not impossible to form without machining, and a sand casting would be less accurate as to size and require more work in polishing than the die casting, hence the latter is chosen and proves its utility.

Use of inserts is entirely feasible in making brass die castings, as is shown by the cranked handle part, for a soap dispenser, shown in Fig. 1. In this case, the insert is a steel rod and, despite the time required to place the insert in the die, the casting is produced at the rate of about 1200 per 8-hr. day.

Caps with wings to assist unscrewing are sometimes cast in sand, but coring lacks the accuracy obtained with the part of this type shown in die cast form. (Fig. 3.) In this cap, used as part of a spray gun, the angles formed by the end of the core are important, and separate cores with various angles are used for different lots of castings. A two-cavity die for this part costs well under $200 and the caps produced in it save the customer considerable in machining as compared with a sand cast cap, besides being much stronger than the sand cast type.

The door knob, with recess for a tumbler lock, shown in Fig. 4, is readily die cast in brass. An alloy containing 62 per cent copper and the balance zinc, is used for all parts here mentioned except the one in red brass. In the knob illustrated, the tubular extension is made in a screw machine and used as an insert, although it could be cast integral. If so cast, however,

FIG. 3—Die cast brass wing nut in which the angles, accurately formed by the core, are important and minimize machining.

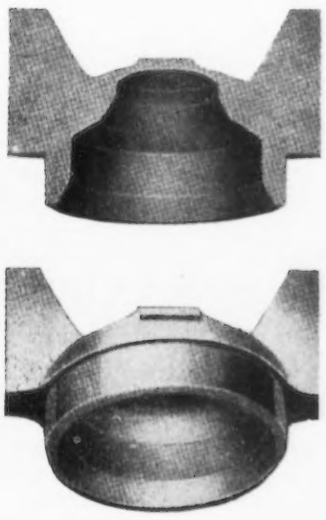
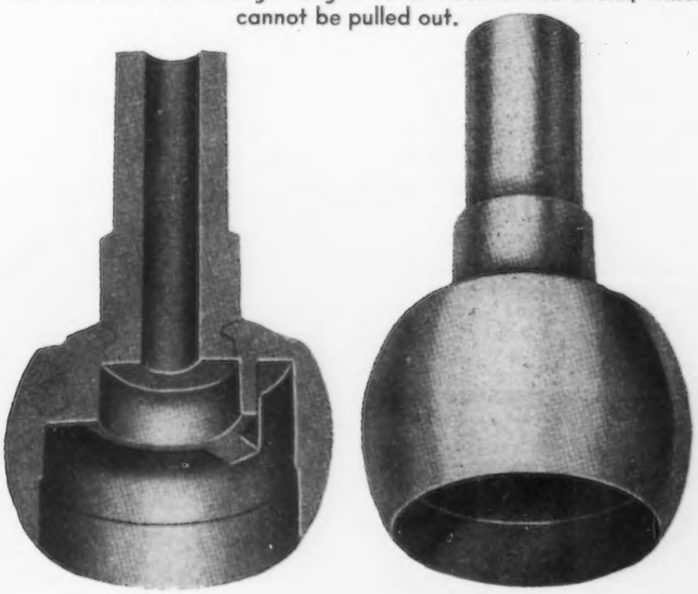


FIG. 4—Door knob with recess for a lock. The hollow shank, produced in a screw machine, is used as an insert, the knob being cast around it and filling the groove or neck in the shank, which cannot be pulled out.



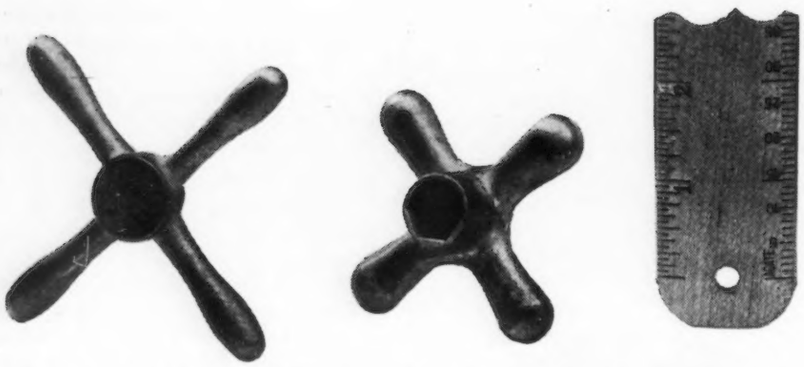


FIG. 5—Faucet handle with a cored hex hole, and a valve handle, both of which are strong brass die castings and afford smooth surfaces for plating.

it would be necessary to use a rather long and quite slender core. This is preferably avoided in brass die casting, since the pull required is long and a slender core pin may be bent and require frequent replacement. By using the insert, the pin merely positions the latter in the die and is protected from bending by the insert itself, which is quite inexpensive. The remainder of the casting, formed by the die to the irregular shape shown, shrinks tightly onto the insert, which is necked so that it cannot pull out. A part such as this could not be produced complete on the screw machine and, even if it could be, would involve a large waste of metal. If sand cast, much machining would be needed and the cored interior would lack the accuracy attained in the die casting, which requires very little machining.

Valve and faucet handles (Fig. 5) are among the parts being die cast in brass with a finish and strength much superior to sand castings. Some of these castings have a hex cored in the hub portion and held within dimensional limits so close that no machining is needed, a condition not fulfilled in a sand casting.

It will thus be seen that the brass die casting is making a well deserved place for itself among metal products produced on the Pacific Coast, much as it has done in the East and Mid-West. Although it can be substituted with advantage for certain other types of parts under favorable conditions, there are, of course, many conditions under which it is not the best answer to a given problem. When, as in many cases, such as have been described, it yields worth-while economies, it is a mistake to sacrifice them. In many cases, at least, and especially in those where the die casting is thought to have possibilities, these may well be investigated along with other alternatives and that which gives the most favorable all-around results selected. Die castings in zinc and aluminum alloys are cheaper than those in brass, but each form has its own peculiar advantages which can be quickly pointed out by a company equipped to make all these types. Brass die castings rank very high in strength and possess a high degree of corrosion resistance.

New Aluminum Die Casting Machine

EXPERIMENTAL tests on the high pressure die casting of aluminum have indicated a definite improvement in the structure of the castings with increases in the injection pressures. Also, the injection of aluminum in a slush or plastic form reduces the time required to solidify the casting in the mold and also produces a solid casting. [See THE IRON AGE, Nov. 28, 1940.]

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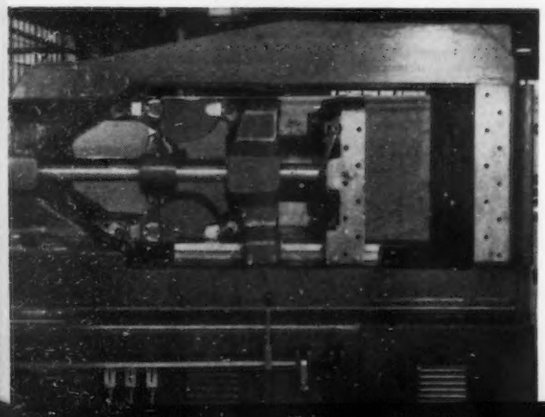
This view shows the quick central die adjustment. The toggle link cams take the shock load of the injection off the toggle pins.



A machine has been developed by the Lester Engineering Co. and built by the Phoenix Machine Co., Cleveland, capable of die casting aluminum melted to a slush form, at injection pressures ranging from 11,000 to 22,000 lb. per sq. in. and of sufficient capacity to produce castings of 2 lb. and 3.3 lb. per shot. In the new machine the aluminum is ladled from a crucible with a crucible ladle, directly into the ported hardened steel injection cylinder.

Injection is accomplished by a hydraulic system of sufficient capacity and pressure to supply the constant high injection pressure required. The total pressures used, also the total volume or rate of injection movement, can be controlled independently of each other, if desired. The injection plunger and the hydraulic cylinder packing gland, are water cooled.

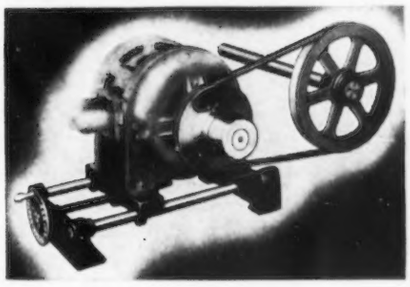
The two halves of the die or mold are held into positive close contact to withstand separation by the injection pressure thus preventing the formation of flash on the casting. This is accomplished by the application of a double toggle link mechanism, which is actuated by a hydraulically operated piston, a locking pressure of 600 tons is developed, as shown in the accompanying photograph. The stress of the shock load resulting from the metal injection at high pressure is not applied to the toggle pins but is transmitted directly into the "U" frame. When the two toggle links are in the closed position, cam faces located at each end of each toggle contact and are aligned with like cam faces on the moveable plate and on the frame; the shock load is thereby transferred through each toggle link without applying further stress to the toggle pins.

New Equipment . . .

Power Transmission:

In the following are described new developments in variable speed gearing and motors, in belts, chains and drives; also in ball and roller bearings.

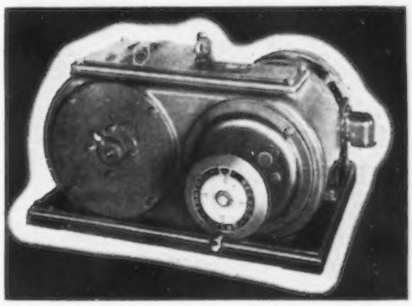
SMALL motors may now be fitted with a new variable speed drive, the Reeves Vari-Speed Jr., made by the *Reeves Pulley Co.*, Columbus, Ind. This attachment is built in six sizes for use with motors from ⅛ to 1½ hp. and it provides speed control over a range from 1¾ : 1 to 2¾ : 1. The standard Vari-Speed Jr. comprises a disk assembly and an adjustable motor base. The former consists of two cone-shaped disks (one laterally adjustable), a self-adjusting tension spring, nut and cover. This assembly is mounted directly on the shaft extension of the motor, which is fixed on an adjustable base. A standard V-belt is used. By means of a handwheel the motor is moved to and fro. When nearest to the driven sheave, the V-belt runs over the largest diameter of the



disks and maximum speed is secured. Reversing the handwheel moves the motor away from the driven sheave, reducing the effective diameter and reducing output speed. The unit is also available in a countershaft type for unusual reductions or increases of speed.

Speed Indicator for Variable Speed Drive

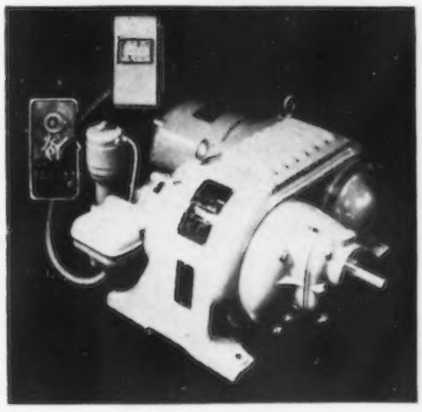
FOR use with Reeves variable speed transmission. the *Reeves Pulley* Co., Columbus, Ind., announces a new handwheel speed indicator. Operation of device is based upon the varying ratio between the two drive disks as each turn of the handwheel adjusts them. For each turn of the shifting screw, the Speedial, with indicator pointer attached, registers one point on the circular scale. Depending upon



the speed ratio of the unit with which the speed dial is to be used, gear ratios of 20:1, 30:1, 60:1 are available and the dial is calibrated accordingly in from 0 to 20, 0 to 30 and 0 to 60 turns of the shifting screw. Space is available on the dial for the user to enter his own calibration in whatever units he prefers. Blanks can also be calibrated by the makers.

Variable Speed Drive Motors

COMPACT and small units are announced by the *U. S. Electrical Motors, Inc.*, Los Angeles and 80-34th St., Brooklyn. These motors are of

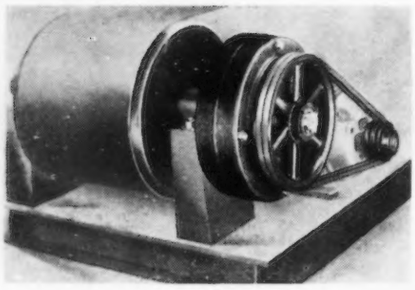


the Varidrive speed design with the double and triple reduction gears. No sub-base is needed for mounting the Varidrive and Syncrogear, saving both space and weight. New is also the possibility of mounting the Varidrive case at any angle with the gear case. The construction of the motors and gear cases is very strong throughout, taking care of heavy torsional stresses due to heavy load and low speeds. The gears are surface-hardened.

Automatic speed control as required in many industries, particularly in the ventilating and heating industries, is designed anew in a system of electric remote control for the Varidrive motors by the above firm. This system consists of a small worm gear reducer mounted on the control case and connected to the control shaft. Pilot motor is operated by a thermostat, float switch or similar control through a cyclic relay or process timer. The one controls the direction of speed change while the other governs the rate of change of the speeds.

Reduction Drive

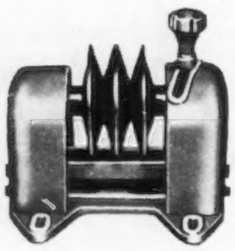
SIMPLIFIED installation is one of the features of a new reduction drive, which is being produced by the *American Pulley Co.*, Philadelphia. The equipment consists of two major elements: First a helical gear reduction unit which mounts directly on the shaft of the driven machine; second a standard belt drive between the motor and the input shaft of the reduction unit. The reduction itself has a fixed ratio of 13 to 1, greater or lesser ratios being accomplished by changes in the ratio of the belt drive. There are five models to cover the applications from ½ to 30 hp. For speeds below 11 r.p.m. special units can be assembled. Because the American reduction gear mounts directly on the shaft of the driven machine, no space for special



foundations is required. The overall efficiency of the drive is said to be very high.

V-Belt Variable Speed Transmission

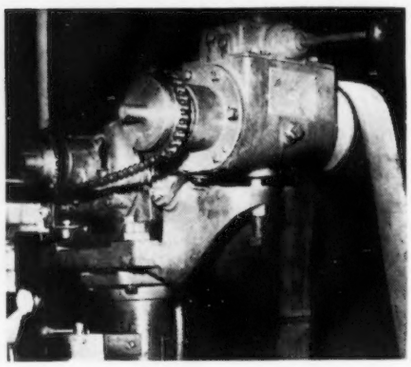
VARIABLE pulley principle is applied for the new V-belt all-speed transmission, introduced by *Standard Transmission Equipment Co.*, 416 W. 8th Street, Los Angeles. The speed selector consists of two interlocking pulleys mounted on a common shaft. The variable speed spindle can be pivoted laterally between the motor and the driven machine to provide new



running diameters on the interlocking pulleys. The selected speed is maintained by means of a lock nut on the control quadrant. In keeping with the aim to provide speed selection economically, the Allspeed combines durable construction, wide speed range with an attractive design. It is made in three sizes for ⅜ in., A and B belts, speed ranges up to 12-1. All are bronze bearing equipped and have forced lubrication. Vertical mounting of controls is possible.

Chain Driven Machine Tool Transmission

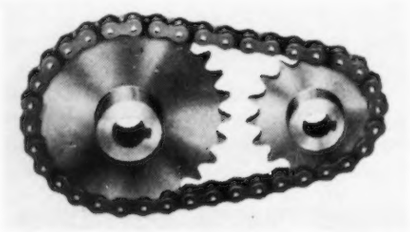
CHAIN drive has been adapted to machine tool transmissions by the installation of Morse chain driven Western transmissions on production lathes, millers, shapers, turret lathes, etc. The advantages of this type of device, pointed out by *Morse Chain Co. and Western Mfg. Co.*, Detroit, are: Positive speed ratio, insuring accuracy of final speed governed by transmission, lessened bearing friction due to slackness of chain drive, and greater facility for changing speed ratio. This is done by changing one sprocket and adding or removing quickly detachable chain links. The chain drive is enclosed in a guard with drip oiler cup. Silent operation of chain transmission has lately been ap-



proached by increasing the number of sprocket teeth and the lineal speed of the drive.

Light-Weight Roller Chain

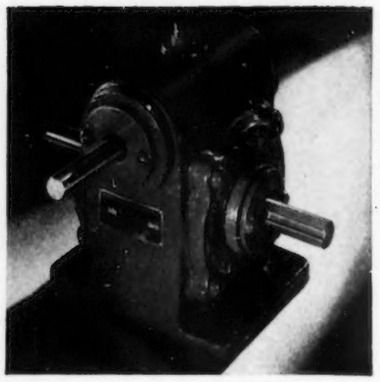
HALVING the weight of the smallest power transmission chain previously produced in the United States to 1¾ oz. per ft., the No. 88 roller chain of the *Diamond Chain & Mfg. Co.*, Indianapolis, was developed for dependable power transmission where extremely high speeds or where compactness and accuracy are essential. In spite of its minute dimensions, 0.315 in. (8 mm.) pitch, with rollers 0.197 in. diameter by 0.125 in. width, No. 88 roller chain, pulls 1100 lb. average ultimate strength and it is made



to the same standards as larger chains. Material specifications, case hardening, heat-treating and manufacturing tolerances, are identical. The chain is most useful for light weight machinery, for timing mechanisms, for precision instruments and equipment, etc.

Worm Gear Speed Reducer

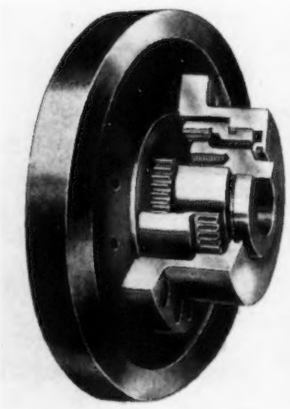
A NEW worm-on-top speed reducer has been brought out by *Winfield H. Smith, Inc.*, Springfield, Erie



County, N. Y. The worm of hardened steel with ground threads is keyed to the shaft. This is mounted on radial thrust type ball bearings. The wheel is made of special alloy bearing bronze. Oil seals of the built-in type are provided at all shaft extensions. The reducer rates at ¼ hp., with torque capacity of 140 to 150 in.-lb. and its ratios are 58, 36, 18 and 9 to 1. The reducer is 6½ in. high and weighs 15 lb.

Flexible Coupling

SPACE saving and full flexibility are the main advantages of the new Manger flexible coupling produced by Farrell-Birmingham Co.,



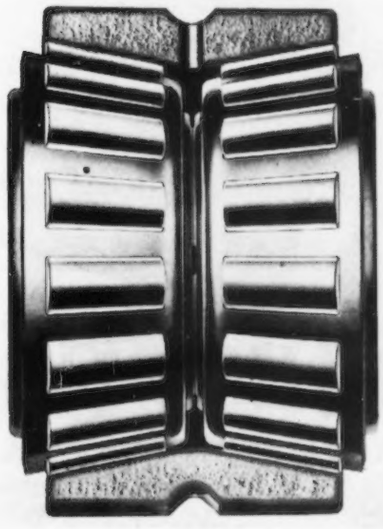
Inc., Buffalo. In this coupling compensation is made by an internal sleeve which floats between an externally geared hub and an internally geared covering sleeve. Internal sleeve engaging hub and outer sleeve is free to slide and rock, adjusting differences in alinement without resistance to free lateral float of the connected shafts. Either hub or covering sleeve may be the driving member. Contact areas are large and heavy oil lubrication will provide a cushion against shock without using flexing materials. Compared with other couplings the Manger needs only about half the space.

Fiber Rolls

IN machines which depend on belt drive the constancy of the rate of power supply will depend to a large extent on the grip between belt and pulley or roll. *The Rockwood Mfg. Co.*, Hamerstadt Street, Indianapolis, claims that a much greater adhesion between the belt and the pulley can be achieved by using fiber rolls: they permit less slip and therefore maintain best the needed speeds, as compared with metal or wood rolls or pulleys. Rockwood has developed a new construction for small and medium sized rolls which provides a tough, rugged hub and spider of zinc alloy cast under pressure into the body of the fiber. This construction makes the rolls low in cost as well as giving improved machine performance.

Roller Bearings for Sheaves

A ROLLER bearing consisting of a double row outer race or cup and two single row inner races or cones has been especially adapted to serve as a sheave bearing by *Timken Roller Bearing Co.*, Canton, Ohio. Rolls and races are ground to established precision limits and when the front faces of the cones contact, proper running clearance is provided. As an alternative design for sheave blocks with hub lubrication, front cone faces are slotted and chamfered as shown



and thus eliminate the necessity of providing a deep annular groove around the shaft for lubrication. The seals of the bearing are improved and simplified. Bearings are designed to a minimum width with a large internal diameter in relation to the outer diameter, also with a maximum radial and thrust capacity for the space occupied. The bearing is of extreme rigidity and prevents wobbling of the sheave.

Pulley Oiler

VISIBLE, unbreakable loose pulley oiler for slow and high speed application without flooding has been announced by the *Trico Fuse Co.*, 2948 N. 5th Street, Milwaukee. The oiler is intended to replace common grease

cups and to supply visible, automatic, fool-proof lubrication. A copper tube transmits the heat from the pulley hub to the oiler producing quick thermal action. A wick feeds the oil to the hub. No attention and no adjustments are necessary—except refilling. Capacity 1 or 2 oz.

Ball Tooth Universal Joint

FLEXIBLE universal joints ordinarily deteriorate rapidly due to a comparatively small area of contact. Lubrication can do little to prevent an early break-down. Therefore the *Petroleum Engineering Co.*, 90 West Street, New York, has developed the Consolidated ball tooth universal joint which avoids the danger of point contacts. It consists of a crown of hemispheres opposed by and meshing with a ring containing cups to fit the spheres. Both male and female parts are hinged together. The joint allows a play of 90 deg. Through the two wheels, power is transmitted in a gentle rolling action in any position. This ball and socket design gives a more positive and larger surface contact with increased strength. Direct lubrication reduces wear and increases efficiency.

Improved Pillow Blocks

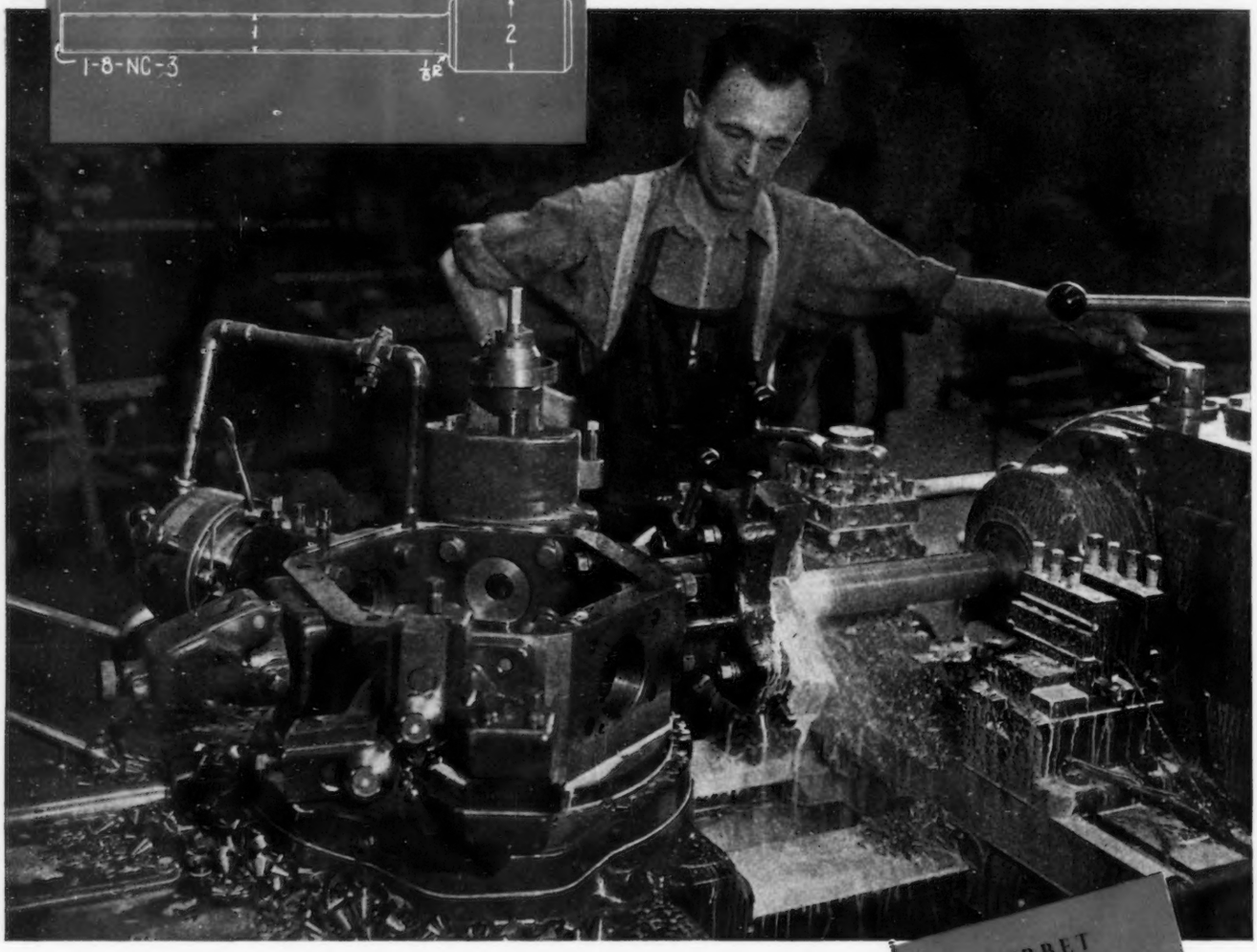
BROUGHT up to date are Ahlberg pillow blocks by the incorporation of neoprene (synthetic rubber) seals to protect the bearings and retain the lubricant. These blocks are produced by the *Ahlberg Bearing Co.*, 3054 W. 47th Street, Chicago. The new seal rings turn with the shaft and float in the housing. They are of the

effective labyrinth type, frictionless and long-wearing. Complete units consist of full self-alining, precision ball bearings, mounted in one piece Parkerized housings. The design lends itself to light and normal service where reliable, yet inexpensive bearings are required. Picture reference: (1) Self-alining ball bearing, (2) sturdy one-piece housing, (3) removable end cap, (4) no-drag labyrinth seals; (5) simple mounting wrench.

Ball Bearings With Extended Inner Race

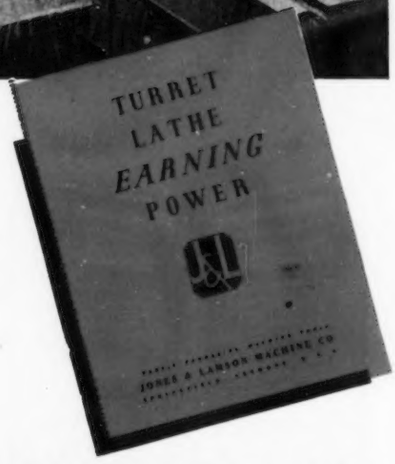
EXTENDED inner ring bearings are announced by the *Stephens-Adamson Mfg. Co.*, Aurora, Ill. They are an addition to the Sealmaster ball bearing line. These bearings are for machine application on straight shafts, and are protected by a patented centrifugal labyrinth seal. Greasing is permitted through an annular grease groove with two holes in the outer diameter. Maintenance is reduced to a minimum by prelubrication. Knurled, cup point set screws are furnished as standard equipment, but one-half dog point set screws with lock wire can be supplied alternatively. The bearing is fitted with snap ring against bearing location and permits through bore in the housing.

Step up your Earning Power as with modern



A TYPICAL EXAMPLE OF THE EARNING POWER OF JONES & LAMSON MACHINES

This new 7A Jones & Lamson Saddle Type Universal Turret Lathe is machining these Threaded Rods in less than half the time required by the older type machine, previously used. High spindle speeds and great rigidity get the most out of the carbide tipped turning tool on this type of work. Note the copious supply of coolant to the tool directly from the hexagon turret.



JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

MANUFACTURERS OF SADDLE & RAM TYPE UNIVERSAL TURRET LATHES . . . FAY AUTOMATIC LATHES . . . AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES . . . AUTOMATIC THREAD GRINDING MACHINES . . . COMPARATORS . . . TANGENT AND RADIAL, STATIONARY AND REVOLVING DIES AND CHASERS.

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JONES & LAMSON TURRET LATHES

PROFIT PRODUCING
MACHINE TOOLS

WITH increasing demands on turret lathe production, new machines may be needed in your plant. What turret lathe will you buy? What make of turret lathe will not only boost production but give you maximum profits on your increased volume?

You know that the higher spindle speeds required by modern fast cutting tools demand more of your turning equipment than older machines can give, though they may still be making money on some jobs.

Every piece of modern Jones & Lamson Equipment embodies in its design, features that provide ease of handling and ample reserves of speed, rigidity and transmitted power.

These features are explained in greater detail in a new Jones & Lamson book, "Turret Lathe Earning Power." This book is first aid for management in settling the problem of turret lathe equipment for today and tomorrow.

A copy of this book is yours for the asking, and asking involves no obligation. Write for it today.

Please send me my free copy of "Turret Lathe Earning Power"

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I A

On The Assembly Line

BY W. F. SHERMAN
Detroit Editor

• Canadian action in stopping imports of American automobiles, together with excise taxes on Canadian manufactured cars, a severe blow to industry. . . . Chrysler adds heavily to its payroll by bonus payments and higher wage rates . . . Hudson declared a union shop

DETROIT — Export departments of automobile companies are dismayed by the realization that recent war-inspired actions of the Canadian government put an end to the export of American automobiles to the best customer outside U. S. borders. In addition, excise taxes on Canadian car manufacturers' prices are such that they will virtually disrupt manufacturing of passenger cars and most commercial cars in the Dominion.

Taxes up to 80 per cent of the manufacturer's price will be imposed under the new regulations. This will apply to prices above $1,200. A 40 per cent tax will apply to most Canadian-produced cars —those between $900 and $1,200. On manufacturer's price up to $900 the tax has been doubled with an increase from the normal 10 per cent to 20 per cent.

Imports by Canada of U. S. cars and trucks in the first nine months of this year totaled 12,942, valued at $10,366,543, and in a year such as this one might have exceeded 17,000 vehicles with a value of about $14,000,000. This is only a fraction of the total loss, however. Canada has imported far more parts for assemblies than actual automobiles. In the first nine months of the year, for instance, American plants shipped $29,643,933 worth of parts for assembly into cars in Canada, and the total for an uninterrupted year might have come close to $40,000,000. The "freezing" of Canadian designs—announced before the ban was put on imports into Canada—will cause an important reduction in the importation of parts; and high taxes on Canadian cars will reduce sales volume so much that 1941 probably will not see any important exports of parts.

Automobile Industry Is Protesting

The automobile industry is already making protests on the basis that all of its organizational efforts in Canada will be torn down and destroyed. Sales organizations and service organizations both will feel the effects. It is the automotive viewpoint that both passenger cars and commercial vehicles now have such general importance in the scheme of transportation and communication that the industry's products and their servicing can not be classified as "non-essential" even under the stress of war-time economy.

Packard, Hudson, Nash, Studebaker and Willys, the independents who do not operate assembly plants in Canada at present, will be most immediately and completely affected. Ford, General Motors and Chrysler, already devoting large parts of their Canadian efforts to war work, will see their few remaining automotive sales possibilities decimated. Because of their participation in Canadian war work, they will, however, have the possibility of keeping their factory organizations alive.

Last week a Canadian visited Detroit in an attempt to find out how the proposed collaboration of America's automobile and aviation industries on plane production might be fitted into the British scheme of things. It appears that in Canada there is a belief that the remaining capacity of Canadian automobile plants should be devoted to making parts for assembly into airplanes, and that perhaps some of the parts production in Detroit might be sidetracked to Canada. If the Canadian investigated far enough he probably has been able to report back that the airplane industry can see little possibility of realizing the goal of the plan here in less than 18 months; the automobile manufacturers who, after all, would be ultimately responsible for their own performance, disagree violently and assert that they could achieve the start of production within six months.

While production of Ford Motor Co.'s airplane engine plant for the production of Pratt & Whitney power plants is proceeding on a 24-hr. a day basis, Ford is also about to launch into the production of magnesium castings. A foundry, possibly the first "captive" foundry of its sort, will be installed at the Rouge for this purpose. Meanwhile, some automobile forge plants are making serious experiments with the forging of aircraft parts, particularly larger sizes. Study of the aviation defense program that is ahead of them has convinced automobile manufacturers that they should become familiar with the necessary techniques.

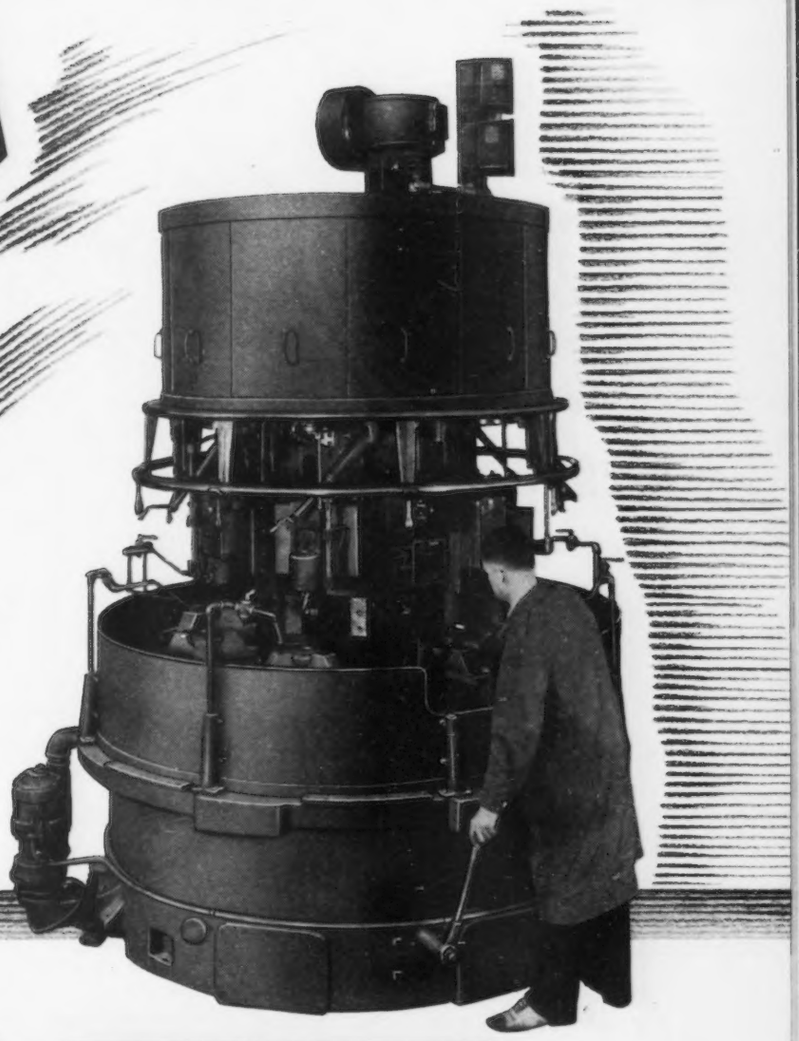
Among the war products now in production in Detroit is an item being referred to as a "bomber dolly" unit, at the Ford plant. The complete unit consists of a pickup type truck with an overhead rail supported lengthwise above the pickup box (this to support and carry a one-ton bomb) and two bomb dollies which are towed behind.

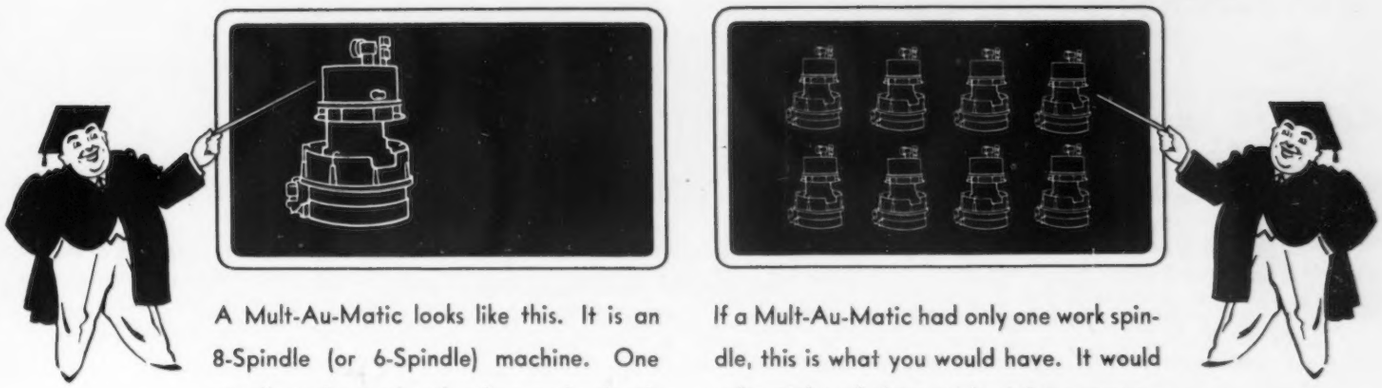
Chrysler Payroll Increased

As a result of union agreements reached during the week, $6,744,000 was added to the Chrysler payroll and $150,000 in the form of a bonus was added to the Hudson payroll. The Hudson contracts provide for the first time a union shop in a major automobile plant, affecting approximately 10,000 workers.

A breakdown of the Chrysler figures indicates that approximately $2,600,000 will be paid before Christ-

A LITTLE B A C Stuff





A Mult-Au-Matic looks like this. It is an 8-Spindle (or 6-Spindle) machine. One spindle is devoted to loading and unloading. *All* the others are working *all* the time. One man can operate it.

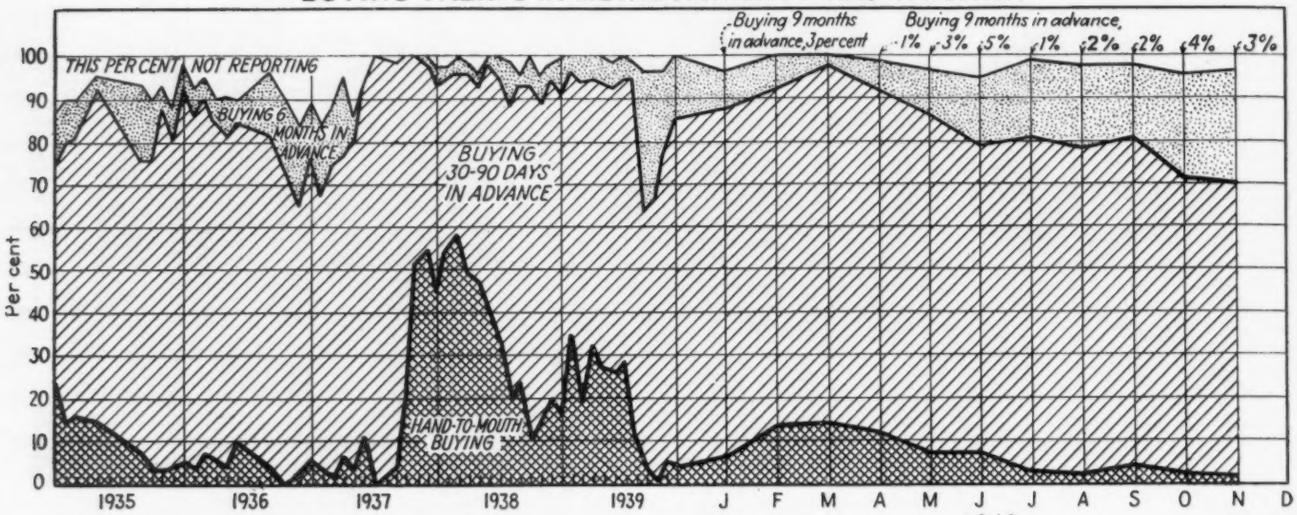
If a Mult-Au-Matic had only one work spindle, this is what you would have. It would take eight of them with eight operators and eight times the space to do the same amount of work.

When the economy of the Mult-Au-Matic Method is considered, plus the fact that Bullard experience produces machines capable of unusual sustained accuracy, the reason for their popularity becomes clear as crystal. Current demand has put a heavy load on our plant, even under 24 hours-a-day operation. We are doing our best to meet it.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

BUYING TRENDS IN METAL-WORKING FIRMS IN DETROIT



mas to more than 60,000 employees in the form of a $40 allowance in lieu of a vacation with pay. The employees affected are those hourly rated men covered by the contract who had at least one year's seniority on Nov. 30, 1940. Another $2,500,000 will be paid as a result of the second point of the agreement which provides for an increase in hourly wage rates of 2c. The rates so affected will be fixed for one year. Another $1,644,000, it is estimated, will be paid to workers as a result of an adjustment of pay and hours in plants working three shifts a day. Chrysler agreed that employees in such plants on full-time schedule shall work 7¾ hr. and have ¼ hr. for lunch but be paid for 8 hr.

Other points in the Chrysler agreement call for an accumulation of seniority of men called to military service and payment by the corporation of their group life insurance for a period of one year unless the government provides other insurance for them. Still other provisions concern seniority and overtime.

Hudson Declared Union

While Hudson officials disputed the union's claim that a clause in the contract provided for a union shop in the generally accepted sense of the term Dr. John R. Steelman, head of the United States Conciliation Service, was quoted as terming the clause a union shop provision without qualification. James F. Dewey represented Dr. Steelman in the negotiations.

The disputed clause reads as follows: "The company agrees that employees who are members of the union, or who may become members of the union, and as such have accepted this contractual obligation, remain in good standing." The company pointed out that the clause did not require new employees to join the union, but union officials said that Hudson employees, who are virtually 100 per cent organized, would be required to remain in good standing with the union in order to continue in the company's employ.

The Hudson bonus of $150,000 also is to be paid in lieu of vacations with pay.

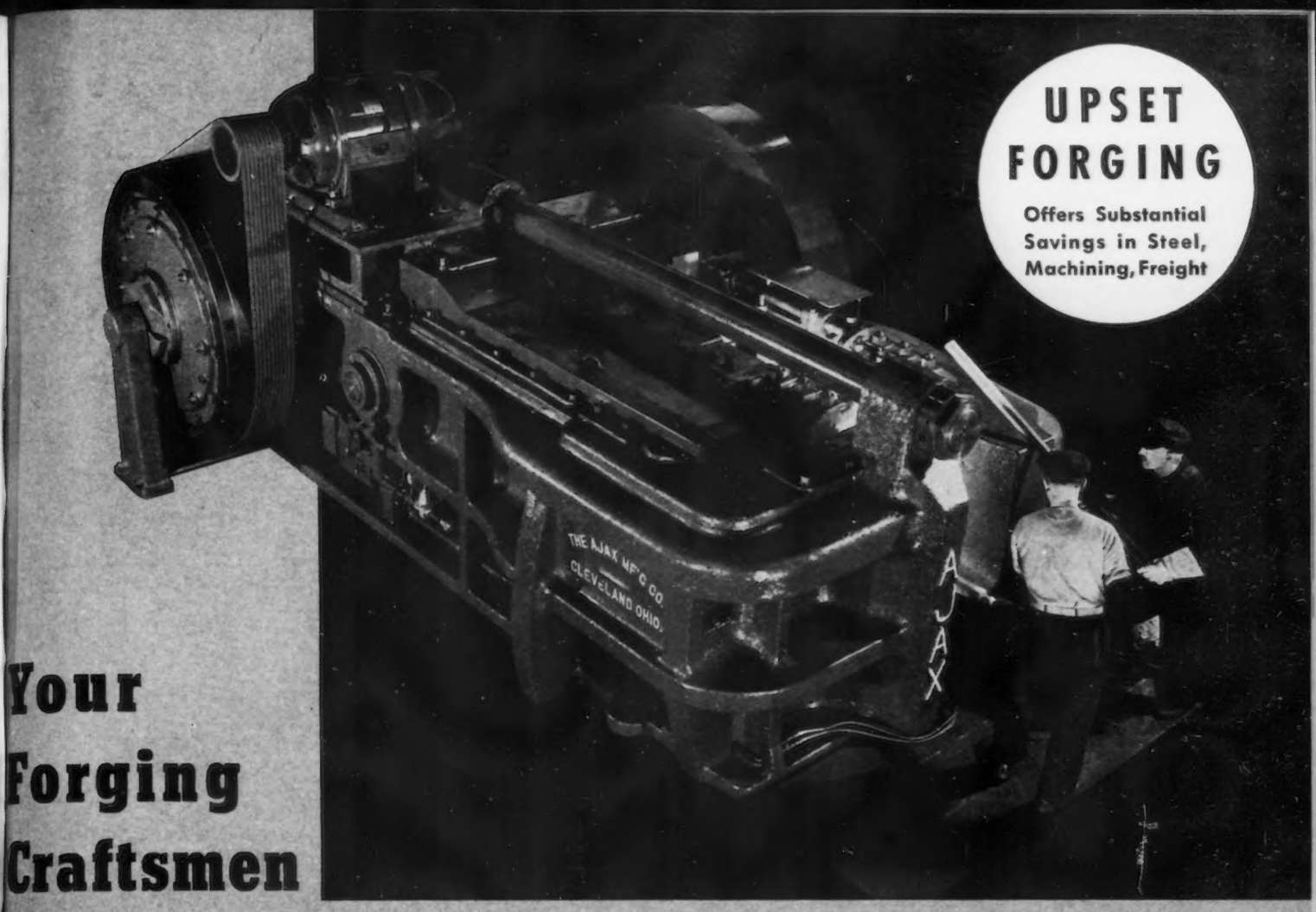
Minor fluctuations mark the weekly reports on automobile production. In the past week output was 125,626, a slight rebound from the previous week's 124,790, according to Ward's Automotive Reports. Output in the corresponding week a year ago was 118,405.

Detroit

• • • **The annual meeting** of the Society of Automotive Engineers will be held at Book Cadillac Hotel, Detroit, Jan. 6-10, and the tentative program has been announced. Twenty-one technical sessions are on the schedule. National defense authorities such as Major General E. B. Gregory, quartermaster general, Major General C. L. Scott, commanding general, armored force, Major General G. H. Brett, chief of air corps, Rear Admiral J. H. Towers, chief of bureau of aeronautics, and William S. Knudsen, national defense advisory commission, will be on the program.

A display of military equipment of the Air, Ordnance and Quartermaster types will be staged on Washington Boulevard in front of the hotel. The SAE Engineering Display, an annual exhibit, will be held in the Book Cadillac.

Of special interest will be a talk on "Made in America Substitutes" by H. W. Gillett of the Batelle Institute, a symposium on synthetic materials including rubber, by L. B. Sebrell and R. P. Dinsmore, Goodyear Tire & Rubber Co., and, on metal, Zay Jeffries, General Electric Co. Also there will be a session on steel metallurgy under the Standards Committee in which the following will participate: A. L. Boegehold, General Motors Research Laboratories, F. E. McCleary, Chrysler Corp., O. V. Greene, Carpenter Steel Co., M. Asimow, W. F. Craig and M. A. Grossmann, Carnegie-Illinois Steel Corp.



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Offers Substantial Savings in Steel, Machining, Freight

Your Forging Craftsmen can feed stock faster and with less effort on AJAX Air Clutch Forging Machines

Forging machines that unduly fatigue forging craftsmen *slow up production!* Ajax Air Clutch Forging Machines decrease fatigue because tripping has been made so convenient that operators can, on production work, unclutch the machine and re-engage it for the next pass before the machine has come to a stop. No need to stand on foot pedal to achieve speedier production.

The Air Clutch on Ajax Forging Machines engages at any point in its cycle, permitting the craftsman to adjust the operating cycle of the machine to his most productive and natural working rhythm, instead of having to adjust his movements to the fixed operating cycle of a machine. Thus, on Ajax Air Clutch Forging Machines, the output is limited only by the operator's ability to feed stock—on certain jobs production has been increased as much as 25%.

Operations that formerly involved an undue amount of exertion are easier to perform because of these three exclusive operating advantages of Ajax Air Clutch Forging Machines:

1. Effortless tripping, through a foot valve with small movement, enables the operator to support his weight all the time on two feet, in a well balanced position, as it is unnecessary to kick or throw his weight on a pedal.
2. Instant response of air clutch relieves operator from supporting bar in tense position after tripping, waiting for the machine to respond.
3. Correct operating height and convenient throat design, obtained without sacrificing bed rigidity at the support of the stationary die, facilitate feeding, since the distance the bar must be handled forward into the machine is minimized, and the operator can stand close to the dies where the bar can be supported with least exertion.

You can substantially increase production of upset forgings and reduce costs with Ajax Air Clutch Forging Machines. They are being used to produce a wide variety of consistently uniform, accurately matched forgings, weighing from a few ounces to many pounds. Write for Bulletin 65-A which describes sizes from 2" to 8".

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Washington

BY L. W. MOFFETT
Washington Editor

• President's proclamation placing steel exports under licensing system long expected . . . Japan, the nation chiefly affected, took 293,000 tons of American steel in first 10 months of 1940

WASHINGTON — The President's proclamation of last Tuesday placing iron and steel products and their raw materials under an export licensing system, effective Dec. 30, had long been expected. It is understood that the order was drafted and sent to the White House at about the time scrap export licensing was applied to all grades of old material. This was on Oct. 15, and Col. Russell L. Maxwell, Administrator of Export Control, has expressed gratification over the success of scrap control. In a statement of last Wednesday, Colonel Maxwell pointed to the November scrap export license figure of 59,070 net tons as compared with the October total of 1,195,301 tons, a reduction of 94 per cent. (These figures refer only to the amounts for which export licenses were granted and should not be confused with shipments.)

The clamping down on exports of steel and its raw products, like restrictions on scrap exports, is officially attributed to the need of conserving supplies for American national defense requirements. That purpose unquestionally is a factor that prompted the action. But it is also true that another primary design is to shut off exports to Japan. No longer can Japan get a pound of American scrap. After Dec. 30 she will not be able to get a pound of American iron or steel or their raw materials, for the licensing proclamation is so comprehensive that it completely covers each category. So far as raw materials are concerned the prohibition of exports will not affect Japan, since she has imported no American ore. Nor has she imported any pig iron from this country. She has taken only negligible quantities of ferroalloys from the United States.

Imports Relatively Small

But Japan will feel the effect of being deprived of American semi-finished and finished steel, though as related to her consumption Japan's imports of American steel are small. At the same time exports of American steel to Japan increased 225 per cent to 293,000 gross tons in the first 10 months of 1940 over the 129,200 tons exported in the corresponding period of last year.

The heaviest shipments to Japan in the 1940 10-month period came within the Department of Commerce classification of ingots, blooms, billets, etc. But only small ingot tonnages, if any, have gone to Japan, so exports in this group have really been confined to blooms, and billets, chiefly the latter. Exports to Japan in 1940 of these semi-finished products through October totaled 94,000 tons. Another semi-finished line, wire rods, accounted for 50,000 tons, making a total of 144,000 tons, or almost one-half of all steel exports in that period to Japan. Ranking next were merchant steel bars, 31,000 tons. Other exports in gross tons to Japan during the 10 months were: Plain shapes, 14,867; hot rolled strip and band steel, 12,601; relaying rails, 10,966; tin plate, 9511; alloy bars, 5906; plain black sheets, 3257; concrete reinforcing bars, 2433; fabricated shapes, 1521; cold finished steel bars, 1367; plain forgings, 1210; alloy forgings, 570; plain plates, 537; stainless bars, 428; ferro-alloys, other than ferromanganese and spiegeleisen, 249; heavy rails, 208; boiler plate, 184, and galvanized sheets, 145.

Products brought under the licensing regulations follow: Iron ore, pig iron, ferromanganese, spiegeleisen, ferrosilicon, ferrochrome, ferrotungsten, ferrovanadium, ferrocolumbium, ferrocarbontitanium, ferrophosphorous, ferromolybdenum, ingots, billets, blooms, slabs, sheet bars, skelp, wire rods, structural shapes, steel piling, plates, skelps, rails, splice bars and tie plates, merchant bars, concrete reinforcing bars, cold finished bars, alloy bars, tool steel bars, hoops and baling bands, iron and steel pipes and tubes, drawn wire, nails and staples, barbed and twisted wire, woven wire fence, bale ties, fence posts, black plate, tin plate, sheets, strip steel, wheels, axles, track spikes, castings, and forgings.

Steel Regulations Different

The iron and steel export licensing regulations will be operated differently from those covering scrap. Exports of the latter are restricted to Great Britain and the Western Hemisphere. Iron and steel licenses will be granted for exports to the British Empire and the Western Hemisphere, according to the White House statement, "and for the present, so far as the interests of the national defense permit, for exports to other destinations in quantities approximating usual or prewar exports." "Other destinations" means nations friendly to the United States. Some of them—Australia, for example—import American steel. They do not import American scrap. Hence the steel licensing regulations had to be broader than the scrap regulations in order that "friendly nations" would not be cut off from the American market. Japan is nowhere mentioned in either set of executive orders, but Japan is the nation that will be chiefly affected by both. The steel regulations were seen to be necessary, since Japan had turned to increased purchases of American steel after having been barred from the American scrap market.

Winding path taken by finished surface

JUST AS EASY TO FOLLOW AS A STRAIGHT CUT

Milling operations on surfaces that follow a winding path, or veer off at right angles and then double back, are just as easy for the operator of a CINCINNATI Vertical Hydro-Tel as a straight-away conventional milling cut. Notice the job illustrated above. With two hands on the operating controls, and exerting only about one pound pressure with each (hydraulic servo control does the actual work), the operator guides the part under the cutter just as surely and evenly as a tailor cutting suit material. Consider the table control lever, for example. *With this one lever, he controls five table functions.*

Other controls are just as convenient and easy to manipulate, fairly inviting the operator to turn out more work. Catalog M-865 gives you the complete story of the accuracy, productivity, and easy control of CINCINNATI 28″ Series Vertical Hydro-Tel. Write for your copy today.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI, OHIO, U. S. A.

MILLING MACHINES . . . GRINDING MACHINES . . . BROACHING MACHINES . . . DIE SINKING MACHINES . . . CUTTER SHARPENING MACHINES

Steel Consumers Have 60 Days' Supply, Reserve Board Learns

Washington

• • • **A Federal Reserve** Board survey covering 400 representative steel consuming companies indicated last week that half these firms have on hand at least two and one-half months' supply of steel at current consumption rates, that many of the larger companies hold less than this, and that the total amount of steel held by consumers is equivalent to about a two months' supply.

"About two-thirds of the concerns regard their steel inventories as adequate in relation to current consumption," the board said. "Most of the others think their steel stocks are small."

Inventories of steel held as materials by steel consumers, the survey showed, increased between 2 and 3 per cent of ingot-producing capacity per month, from the end of June through September. In October there was apparently little if any further increase in these inventories. Some of the increase has reflected the need for more steel as a consequence of a higher rate of activity in steel-consuming lines, the board said.

It was found that changes in inventories of steel since last June have varied among the different consuming industries. In some, such as the automobile and parts industry, there were increases, largely seasonal. In others, such as the container and heating apparatus industries, there were declines, also partly of a seasonal nature. The survey showed no change in inventories during this period at steel warehouses.

Observing that little expansion in blast furnace and open-hearth capacity has been announced, the board recognized that "consideration is being given to the question whether existing capacity is adequate to produce basic steel needed to meet all prospective demands."

The inventory survey indicated that orders placed from June through November exceeded output but the actual consumption of steel has been smaller than the volume of orders. Part of the orders were said by the board to represent efforts by steel consuming firms to make provision for their requirements further in advance than usual, particularly since delivery periods on many steel products have been extended.

Commenting that exports of steel excluding highly fabricated steel products continue at a level of 20 per cent of ingot producing capacity, leaving for domestic use steel equivalent to about 75 per cent of rated ingot capacity, the report observed that only a little of this has gone to build up inventories. Most of this has been used in the manufacture of other products, largely disposed of to ultimate consumers here or abroad.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

I'LL NEVER GIT THAT! A GUY THAT OWNS HAFF TH' COMP'NY EXPERIMENTIN' AN' MONKEYIN' AROUND WITH TH' MACHINIST TRADE... AN' HIM A MILLIONAIRE! WHY DID HE WORK SO HARD TO GIT OUT OF IT IF HE LIKES IT SO WELL?
YOU DON'T UNDERSTAND LIFE, I SEE -- LISTEN... A GUY WORKS HARD TILL THAT WORK IS PLAY -- BY THAT TIME POLO, GOLF, SOCIETY AN' THAT STUFF IS WORK TO HIM, SO HE NATURALLY WORKS AT THE PLAY AND PLAYS AT TH' WORK -- SEE?
REPAIR ORDER DRAWING
COPR. 1940 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.
THE QUEER GUY
J.R.WILLIAMS
12-20

Washington

• • • **Two errors** were inadvertently made by THE IRON AGE in recent reports on census returns. In the issue of Nov. 21, page 82, it was stated that "In 1937 there were 4,732,553 units (passenger automobiles) manufactured, carrying a value of $2,848,786,150." These were totals for all motor vehicles. The number of passenger cars produced that year was 3,847,800 and their value was $2,296,511,131.

In the issue of Dec. 5, page 76, an article relating to steel spring production in 1939 carried the parenthetical phrase "(excluding automobile springs)." The Census Bureau's Division of Manufacturers advises that data for automobile springs are included in the statistics when made for sale or for intraplant transfer. Such springs are excluded only when installed in automobiles in the same plant location in which springs are produced.

CARBOLOY
DIES FOR SHEET METAL DRAWING
including
CARTRIDGE CASE PRODUCTION

These ADVANTAGES ARE EVEN MORE IMPORTANT *today*—

MORE CONTINUOUS PRODUCTION · **GREATER ACCURACY** · **BETTER FINISH** · **FEWER REJECTS**

Now in use in sizes up to 7½ inches inside diameter

AMONG the many metal working applications of Carboloy cemented carbide for the production of defense items, is its use in the form of dies for the cupping, drawing, redrawing, sizing, tapering and shouldering of cartridge cases. For such work the established benefits of Carboloy Dies in terms of more continuous production, greater accuracy, and better finish are of extreme importance today.

The experience of the Carboloy organization on this specific application is available to all plants in which such work is of interest. In this, as well as in the production of all other parts *requiring processing through dies,* Carboloy service is at your disposal.

To facilitate prompt transmittal of recommendations we suggest you include complete description of application and sketch or blueprint of part with your inquiry.

CARBOLOY COMPANY, INC., DETROIT, MICH.

Chicago—Cleveland—Los Angeles—Newark—Philadelphia—Pittsburgh—Worcester, Mass. Authorized Distributors: Hartley Wire Die Co., Thomaston, Conn.—In Canada: Canadian General Electric Co., Ltd., Toronto, Canada.

CARBOLOY CEMENTED CARBIDE WIRE AND BAR DIES ★ TUBING DIES ★ SIZING DIES ★ SPRING AND WIRE FORMING TOOLS ★ SHAPE DIES ★ SHEET METAL DRAW AND RE-DRAW DIES ★ GAGES

Fatigue Cracks

BY A.H. DIX

Fun In A Print Shop

• • • Ignoring a violent disinterest on the part of the eighteen loyal readers of this page in a glossary of unusual terms used in our game, as we call it, we have made a start on one with the aid of Frank J. Winters, your fireside companion's art editor and make-up expert.

DUTCHMAN—*Wedge-shaped piece of wood driven between words in a page of type when locked up on the composing stone to tighten a line.*

BLEED—*Printing to the margin of the page (see p. 65).*

SHOOTING STICK—*Used to drive together the wooden wedges that hold type firm in a form.*

HELL BOX—*Receptacle for discarded, unsorted type.*

KILL—*Cancel.*

DUMMY—*Rough layout of the piece to be printed.*

STONE—*Steel block on which type is assembled.*

MAKE-READY—*Leveling of the type form after placing on the press, to insure even printing.*

STICK—*Narrow metal holder which the compositor holds in his hand and in which he gathers type when hand-setting.*

SPITGUN—*A printing press accessory that ejects a fine spray of quick-drying liquid over heavily inked pages to prevent "offsetting," i.e. one page smearing another.*

TYPE LICE—*Non-existent insects the beginner in a print shop is asked to look for. The wedges in the type form have been loosened; the type has been moistened for cleaning; the beginner looks close for the lice; the type is suddenly jammed together, causing dirty liquid to squirt into the observer's face. Very comical if squirter is bigger than squirtee.*

We could go on with *gutter, alley, dog, chase, fly, pi, pony, niggerhead,* etc., but think it best to stop while your interest is at fever pitch.

Hardly Lucid But Very Legal

• • • If the definitions above are a little muddy, blame Chief Justice Hughes. We just read his ruling in the Bacardi trademark case and for the moment feel as confused as the centipede when asked how he ever knew which foot to put down next. Sample:

> *"When the foreign mark is entitled by virtue of the treaty to reign in a ratifying state and is duly registered there the substantive right to its protection in that state attaches there."*

That's the trouble with these mixed drinks.

Jill The Blacksmiths

• • • The straight photographs that come from the other side are so moving that we wonder the English continue to bother with the posed variety. We saw in the *New York Times* the other day a picture captioned *"A British Jill-of-All Trades,"* showing Miss Connie Wills, age 18, of Mealsgate, England, acting as a blacksmith's helper. She holds a 10 lb. hammer above her head, and looks badly frightened, but the smith looks positively panic-stricken, as though the loss of a hand is the least he can expect.

The caption states that Miss Wills is also a letter carrier and a bartender. She is pretty and slender, and would be far happier if she were back tending bar, and so would the smith.

Prop Misplacement

• • • A contemporary publishes a photo of a plane with the propeller in front, and labels it a pusher type plane. An unsympathetic critic would get the impression that the caption writer throught the plane flew tail end first, but we believe that the caption writer is a purist and applied the truth that there is no such force as a pull. Every application of power is a push. You pull a door open by pushing on the back of the knob.

We are never happier than when defending our craft.

Miniature Monicker

• • • Another of our contemporaries has an article written by a man with the shortest name we have ever seen —Re. That's all there is. Mr. Re must waste much time in placing telephone orders. The listener is certain to say, *"I have the first two letters but didn't get the rest. Please give me the full name. . . .* It can't be. Let's begin all over." He would save time by adding a letter.

Ard Welded Ark

In re names, we see that among those who attended the National Metal Show were John L. Sullivan of Cleveland Graphite Bronze Co., Don Marquis of Thompson Products, and Heywood Brown, of Cleveland Automatic Machine Co.

Floyd Davenport of Fisher Body, Cleveland, is listed as an ark welder, which is worth a new verse in "Old Man Noah."

Too Good For Them

• • • The "guvment" is excusably very fussy about materials used in aircraft construction, but the other day we heard of a case of a certain manufacturer, a maker of bolts and nuts, whose standards are too high. With our own eyes we saw the formal recommendation that he modify the causes for his rejections. Naturally he is very proud of this, but he is also modest, and asked us to withhold his name.

Being less modest, we mention the fact that the other day one of the manufacturing chiefs of a major unit in the aircraft industry had his picture taken at his desk on the occasion of his promotion. Within a few inches of his right hand was a single trade paper—your favorite family journal, which is widely read in the country's most active industry.

Paging Poidometer

• • • On the A.S.M. list we also saw the name of the Schaffer Poidometer Co., 2828 Smallman St., Pittsburgh, which has filled us with a mad desire to know what a poidometer is. We can't find it in our dictionary and if no one tells us we will find out the hard way by writing the company, being unsatisfied with the explanation that it is a kind of Cockney pedometer.

Words Without Music

• • • Our variations on the line *"All the same I'm in the pink, my constitution' lined with zinc"* have brought in several amendments to Ethel Merman's constitution. Fred W. (Westinghouse Air Brake) Pennington offers *"All the same, I'm feeling coy, my head's been turned with Carboloy,"* which balances beautifully. But we are sorry we can't say the same about his, *"All the same I'm acting jolly, my structure's grained with moly."* It limps badly and we can't think of a suitable crutch.

Among the other printable contributions is a dismal effort by George R. Woods to find a rhyme for *aluminum.* George wrestled with his muse and lost in three straight falls. He has *"chassis made of aluminium"* following *"dancing all night in the room Iridium."* That moan you heard came from Shelley's shade.

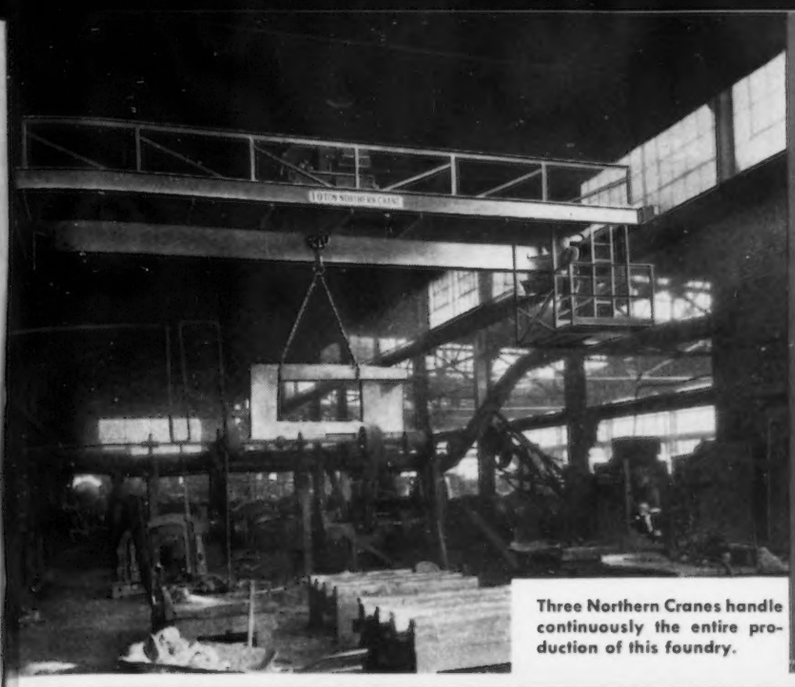
Puzzles

• • • The only one willing to nose dive into the potato problem in the Dec. 5 issue is R. C. (General Spring Bumper Div., Houdaille-Hershey Corp.) Johnson, who figures that the man and boy work equally fast, the man digging three times as fast as the boy, and the boy picking three times as fast as the man.

R. F. Johnson of Buffalo thinks 2½ minutes is enough for this:

> A man stops at a bank to cash a check. The teller transposes the dollars and cents through error. Later the teller discovers his mistake and telephones the man, who finds that he now has twice the amount of the check after having spent $3.50. What was the amount of the check?

Typical Installations of Northern SUPER-CRANES



Three Northern Cranes handle continuously the entire production of this foundry.

Two of twelve heavy duty Northern Cranes in this plant.

The proof of a machine is the service it gives. Northern Super-Cranes are giving excellent service in every type of industry. Users will assure you that these Cranes are not only outstanding in performance, but are economical in operating and maintenance costs, capable of handling extreme overloads, and continuously on the job. We'll send you a list of users if you ask.

High speed general handling crane in electrical manufacturing plant.

NORTHERN ENGINEERING WORKS

2607 Atwater Street — Detroit, Michigan

News of Industry

$247,000,000 Spent For Steel Plant Upkeep

• • • **To keep its plants** and equipment in good running order, the steel industry spent approximately $247,000,000 for repairs and maintenance during 1939, according to the American Iron and Steel Institute.

Wages represented the largest single item in the expenditures for repairs and maintenance. Other important items of expense were the cost of supplies, and the freight charges paid on the supplies purchased.

Repair and maintenance costs in 1939 were about 45 per cent higher than the total of $171,000,000 spent for those purposes in 1938 and were close to the total of $260,000,000 spent in 1937.

The cost of plant upkeep in 1939 was equivalent to about $6.30 per net ton of finished steel produced during the year, as against about $7.10 per net ton in each of the two preceding years. In all three years, repair and maintenance costs represented about 9 per cent of revenue from sales.

Photo by International

BUILT IN NINE MONTHS: This submarine, the Grenadier, christened last week at Portsmouth Navy Yard, was constructed in less than nine months. The craft cost $3,500,000 and is the fourth to slide down the ways this year.

Defense Housing Supply Orders Are Awarded

Washington

• • • **The Procurement** Division, Treasury Department, has announced the first of a series of awards to be made under the plan for mass purchases of supplies for defense housing projects.

The initial awards, made last week, were: Briggs Mfg. Co., Detroit, steel bathtubs, $475,852; Youngstown Pressed Steel Division, Mullins Mfg. Corp., Warren, Ohio, bathtubs, $53,400; Williamson Heater Co., Cincinnati, warm air furnaces, blowers and automatic heat regulating equipment, $38,885.

Explosives Plant Cost Increased $20 Millions

Washington

• • • **The War Department** last Thursday announced the award of a contract to the Stone & Webster Engineering Corp., New York, increasing by approximately $20,000,000 the original contract, amounting to $10,863,000, awarded Sept. 20 for the construction of a TNT, DNT, and tetryl plant at Wilmington, Ill. This brings the construction award for this plant to an approximate total of $31,000,000. The work will be done on a cost-plus-fixed-fee basis.

The plant will be operated by the E. I. duPont de Nemours Co., Wilmington, Del., under a total production award of $17,760,000, as announced on Oct. 19.

Briton Sees Some State Control in Steel Continuing

London

• • • **A warning that a** too sudden removal of state control in the British steel industry might produce chaos was given by W. W. Wood when he was installed as Master Cutler of Sheffield for the second time. He first held the position in 1924-25.

Mr. Wood declared that some liaison between the steel trade and government would probably always be necessary and, provided those in authority understood the trade, that might be all to the good. At the same time, he said, they should aim at strengthening their own domestic associations and, when peace came, the elimination of bureaucracy.

$4,781,094 of Beehive Coke Produced in 1939

Washington

• • • **Beehive coke** to the value of $4,781,094 was produced in 1939, a decrease of 53.6 per cent from the $10,297,530 reported to the Bureau of the Census for 1937. The number of establishments reporting last year was 29, a drop of one under the number reporting in the earlier year. The wage earners primarily engaged in manufacturing in this industry in 1939 were 685, a decrease of 47.7 per cent compared with 1310 reported for 1937, and their wages, $701,108, were less than the 1937 figure, $1,467,856, by 52.2 per cent.

The 1939 output of nails, spikes, etc., by plants other than wire or rolling mills was valued at $12,907,854, an increase of 8.2 per cent compared with $11,929,131 reported for 1939.

The wage earners primarily engaged in manufacturing employed in this industry in 1939 numbered 1937, an increase of 3.4 per cent compared with 2432 reported for 3197, and their wages, $2,730,275, were less than the 1937 figure, $2,746,448, by 0.6 per cent.

A decline of 5.5 per cent was reported in the 1939 production value of $28,606,349 of blowers and exhaust and ventilating fans compared with $30,264,909 reported for 1937.

Agricultural machinery (except tractors) production in 1939, valued at $167,895,292, was a decrease of 25.4 per cent under the 1937 value of $225,044,035.

American Cast Iron Pipe to Pay Bonuses

Birmingham

• • • **American Cast Iron Pipe Co.** has announced it will pay approximately $50,000 in continuous service and cash bonuses to employees. The continuous service bonus, with $20 maximum amount for any employee, will be paid at Christmas time. Cash bonuses ranging from approximately one-half of one week's salary for employees with less than six months' service to about a week's salary for employees with more than six months' service, will be paid after the first of the year.

Coming Events

Jan. 6 to 10—Society of Automotive Engineers, annual meeting, Detroit.

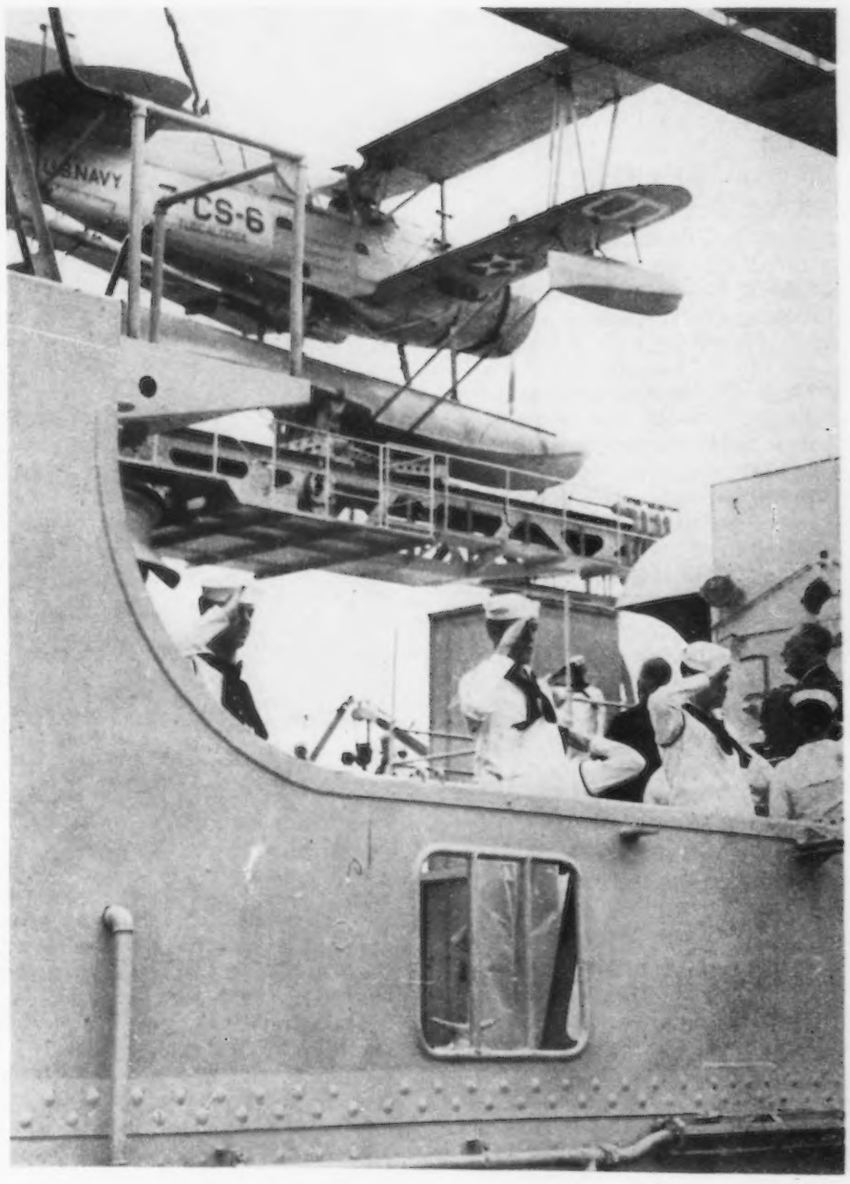
Jan. 7 to 9—Institute of Scrap Iron and Steel, Inc., annual convention, Baltimore.

Jan. 17 to 18—National Slag Association, annual meeting, Birmingham, Ala.

Jan. 20 to 23—National Automobile Dealers Association, annual convention, Pittsburgh.

ISLAND BASES: President Roosevelt has recently inspected air and naval bases traded to the U. S. by Great Britain for 50 overage destroyers.

Photo by International



Freight Car Output Dropped to 26,180 in '39

Washington

• • • **Railroad freight** car production in 1939 declined sharply to 26,180, valued at $68,273, from 90,754, valued at $221,168,859, according to the Bureau of the Census. In each period box cars led as the type produced in largest numbers. The 1939 production of box cars totaled 12,123, valued at $33,490,411 as compared with 35,332, valued at $85,522,191 in 1937.

The total value of cars and equipment—railroad, street and rapid-transit—produced last year was $168,381,877, a decrease of 49.8 per cent under the 1937 value of $335,321,891.

Further Steps Against Price Increases Planned

Washington

• • • **So far prices,** with few exceptions, have remained on a remarkably even keel despite the impact of huge defense orders. But the National Defense Advisory Commission is not so sure that they can be held down unless some positive action is taken to keep them within bounds. Hence, taking time by the forelock, it has taken steps to prevent uncontrolled price inflation. This has been done by drafting a series of executive orders.

The orders were prepared after Commissioner Leon Henderson's Price Stabilization Division listed the statutory powers that have been granted to the President. Inasmuch as some of these powers are said not to be clear it was indicated that Congress may be asked for further legislation specifically to halt unjustified price rises in the event increases threaten to get out of hand.

Sweden to Ship Steel Products to Russia

London

• • • **The new trade** agreement between Russia and Sweden involves shipment by Sweden during the first year of the agreement of 100,000,000 kroners' worth of goods. Russia will export 75,000,000 kroners' worth of goods to Sweden. The latter's imports will be oil, grain and fertilizer, while Russia will import steel products. Sweden is to give Russia credit for 100,000,000 kroner for five years at 4½ per cent.

9700 Persons Seek Jobs At New Plane Plant

Columbus, Ohio

• • • **When officials** of the Curtiss-Wright Corp. began accepting applications for employment here Dec. 9 around 6700 persons applied that day, followed by more than 3000 applicants upon Dec. 10. In preparation for the company's new plant, which will be opened later here, a shop is being installed to train workers. Some 10,000 to 12,000 employees will be required.

104 U. S. SUBMARINES: Pictured as it leaves New London, Conn., on a practice cruise is one of the 104 U. S. undersea boats. Estimates for other countries are Germany, 120; Great Britain, 50, and Japan, 69. The newest U. S. submarines, average 2000 tons undersea displacement, 300 ft. long, 26 ft. wide, 17 to 20 knots (surface speed) and 7 to 8 knots (underwater speed).

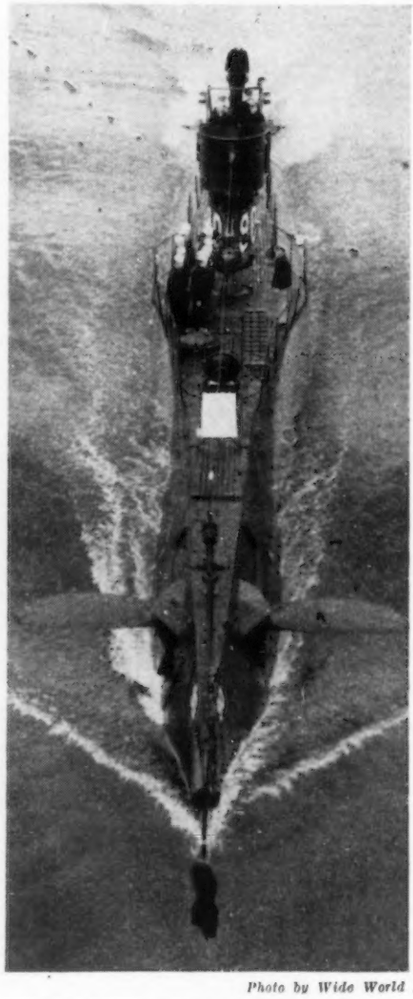


Photo by Wide World

G-F Plant Payroll Includes 2000, Highest in its History

Youngstown, Ohio

• • • **General Fireproofing Co.,** which last year delivered more than $350,000 worth of aluminum chairs to the federal government, holds a large backlog of government orders at the present time, including rush orders for airplane seating equipment and from the U. S. Navy for new warships. The plant is employing 2000 men, highest in its history.

Corporation Income Tax Rate May Advance

Washington

• • • **That the present** corporation income tax rate of 24 per cent on annual net incomes of $25,000 might be increased to as much as 30 per cent before the national defense program is paid for has been predicted by Senator George of Georgia, ranking Democratic member of the Senate Finance Committee. The senator, who said he was thinking "in long-range terms," also pointed out that higher taxes on individual incomes are definitely being considered. Study also is being made with respect to the tightening of provisions covering gift taxes.

These and other proposals will be taken up for a joint study by the Senate Finance and House Ways and Means Committees early in January.

(The 1942 *U. S. budget is expected to call for about* $14,500,000,000. *Present taxes yield about* $9,000,000,000).

Forgings Production Declined in 1939

Washington

• • • **The 1939 value** of forgings made in plants not operated in connection with rolling mills was $104,883,196, a decrease of 14.6 per cent as compared with $122,835,051 reported for 1937, according to the Bureau of the Census. This industry, as constituted for census purposes, embraces establishments primarily engaged in the commercial production of forgings. The industry does not include the manufacture of forged products such as tools, for which separate census classifications are provided, nor of forged parts made and installed by manufacturers of motor vehicles, railway cars, machinery, etc.

Eaton Mfg. Sells Bumper Plant to Houdaille-Hershey

Cleveland

• • • **Eaton Mfg. Co.,** large automotive and aircraft parts maker, has sold its bumper plant at Jackson, Mich., to the Houdaille-Hershey Corp., Detroit. The Jackson plant contains approximately 140,000 sq. ft. of floor space and employs 400 to 500 persons.

Alvin Irwin Findley, Former Editor of the Iron Age, Dies

• • • **Alvin Irwin Findley,** who was for 20 years editor of THE IRON AGE and five years associate editor, died on Dec. 12 at St. Petersburg, Fla., where he had spent his winters since his retirement from active work in 1930, since which time he had been editor emeritus of THE IRON AGE.

Alvin Irwin Findley

Mr. Findley became associate editor of this publication in 1905 and was made editor-in-chief in 1911 and also a director of the Iron Age Publishing Co.

He was born at Monmouth, Ill., on June 29, 1859, son of Samuel and Mary Ann (Hardie) Findley. His father was a public school superintendent, serving a long period as such at Akron, Ohio, and later editor of the Ohio Educational Monthly. Mr. Findley's early education was acquired in the public schools of Akron and in two years at Buchtel College (later University of Akron), after which he spent two years as city editor of the Akron *Daily Beacon* before entering the College of Wooster (Ohio), from which he was graduated with an A.B. degree in 1881 (A.M. 1886).

He was successively an editorial assistant on the Chicago *Interior*, a weekly paper, and a reporter for the Philadelphia *Press*, later returning to Akron as associate editor of the Akron *Daily Beacon*, continuing there until 1889 and for three years following was a special correspondent.

From 1892 to 1905 he was editor of *The Iron Trade Review* of Cleveland (now known as *Steel*) and vice-president of the Iron Trade Review Co. He left that paper in 1905 to become associate editor of THE IRON AGE, becoming editor six years later.

While he was editor of THE IRON AGE its scope was broadened to cover not only iron and steel manufacture but the entire metal-working field. In the absence of a metal exchange the paper had long maintained a system of market reporting which made it the clearing house for iron and steel values, sales amounting to millions of tons annually having been based on its quotations. Production statistics, which at that time had been gathered only twice a year, were introduced by THE IRON AGE on a monthly basis and became a widely accepted trade barometer.

Mr. Findley was the first president of the National Conference of Business Paper Editors organized in 1919 and was a director of the United Publishers Corp. (now the Chilton Co.) from 1924 to 1932. From 1922 to 1935 he was a director and vice-president of the Montclair (N. J.) National Bank. He was for many years a member of the American Iron and Steel Institute, the Iron and Steel Institute (British), American Institute of Mining and Metallurgical Engineers, American Foundrymen's Association, American Society for Testing Materials, American Institute of Weights and Measures, American Academy of Political and Social Science, the Phi Kappa Psi fraternity, and the Phi Beta Kappa. He was trustee of the First Methodist Episcopal Church, Montclair, N. J., and president of the board of that church for a number of years, and a trustee of the Biblical Seminary in New York City.

He was married in Akron, Ohio, May 28, 1884, to Belle, daughter of John Wesley Holloway, superintendent of the Cleveland, Akron & Columbus Railroad. They had one daughter, Grace Helen, who is the widow of Charles A. Vogt, who was auditor and director of the American Steel & Wire Co. at Cleveland until his death in 1917.

In his 38 years in business journalism, Mr. Findley contributed many articles on iron and steel to magazines and the daily press and addressed many associations in the metal-working field. In 1911 he attended the conference of American and European steel manufacturers at Brussels, Belgium, called by Judge E. H. Gary, then chairman of the United States Steel Corporation, to consider the organization of an international association of steel producers of Great Britain, France, Germany, Belgium and the United States.

Industrial Milestones

• • • **On Feb. 13, 1941,** the Excelsior Steel Furnace Co., Chicago, will celebrate its 60th anniversary. This company was founded in 1881 by A. W. Glessner, who started in business at the age of 19 with a borrowed capital of $2,500.

In 1887 the company started the manufacture of furnace pipe and fittings, of which it has become the largest producer. Since that time it has broadened its line to include a large number of metal specialties. The company operates five plants and carries stocks in a large number of cities. It has recently printed a special anniversary edition of its manual and code pamphlet.

How Qualified Plants Can Share in Automotive Program to Build Planes

By C. C. CARLTON

Director, Automotive Committee for Air Defense

Detroit

• • • **The National Defense Advisory Commission** has dropped in the lap of the automotive industries a huge defense assignment, namely supplying aircraft parts in quantity for a new program of building bombing planes by the assembly plant method. Industry-wide aid will be required to "deliver" on this novel and ramified job.

What is the most efficient procedure for a manufacturer who, knowing he has plant capacity available and believing he can use it efficiently for this aircraft program, wants to figure on taking on part of the work?

Two first steps are open to him, both of which have been taken already by several hundred automotive concerns and metal-working firms:

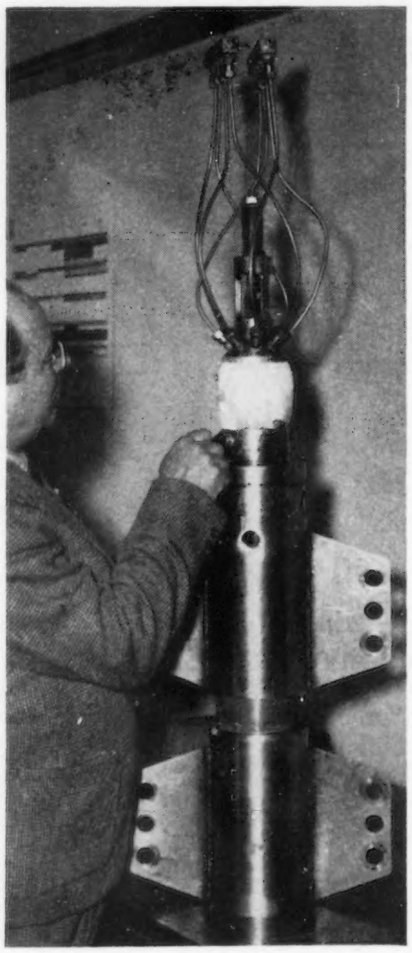
First, write to the Automotive Committee for Air Defense, (8505 West Warren Avenue, Detroit), describing the type and volume of work done by the establishment, the character of equipment installed, personnel employed, etc., and thereby list the plant as available for the aircraft parts work.

Second, send a representative to visit the exhibit of aircraft parts which the committee is establishing at its headquarters, 8505 West Warren Avenue, Detroit. Here with the aid of the U. S. Army Air Corps the committee is gradually accumulating not only blueprints of the plane models which have been selected for this program but actual, disassembled parts and sub-assemblies in various stages of fabrication. The committee has obtained more than 40,000 sq. ft. of floor space for displaying the parts.

This plant is much more than a museum of airplane pieces. The committee is putting together a staff of production men, both from the aviation and automotive industries, and the army is lending experts, led by Major James H. Doolittle of the Air Corps procurement branch.

These men, collectively, are able to describe how these pieces are now being made and assembled; what equipment is used; what performance factors or specifications must be met; what "bugs" will be encountered in getting various results with the special light-weight aircraft alloys that have to be used.

BLAST ENGINE FOR AIRPLANES: Shown here is a new type of jet-propulsion motor which, its inventor claims, may increase efficiency of U. S. fighter and bombing planes. The engine, designed by E. B. Myers, with Dr. Alexander Klemin, head of the Guggenheim School of Aviation, as consultant, is to be used in conjunction with a plane's ordinary engines to produce sudden bursts of speed. *Photo by International*



If a manufacturer wishes to visit the exhibit at this time, or send a representative, he should obtain a special pass entitling the bearer to admission. While few military secrets may be exposed to view at the exhibit, just the same, the U. S. Army maintains precautions to safeguard blueprints and designs. Identification cards may be obtained with a minimum of delay on application to whichever automotive manufacturing trade association the manufacturer belongs, or by applying directly to the committee at the Detroit address.

After writing, or visiting the exhibit, the manufacturer has a choice of two courses. He may embark on experimental studies of parts he would like to undertake, and await call from the committee for a more complete appraisal of his plant's facilities; or he may go out and seek immediate orders to supply aircraft manufacturers who may need assistance to expedite contracts which they already have under way.

The latter method serves a double purpose: It helps relieve the existing pressure on the heavily expanded aircraft companies, and it gives a potential supplier for the larger job ahead the benefit and experience of an "educational order."

Several automotive firms have contracts now—some small and some large—to supply pieces and sub-assemblies for current plane programs. These firms, in a highly cooperative manner, have offered to make available to other establishments the lessons taught by their pioneer experience in an unfamiliar field.

Because the automotive program still is in formative stages, there has been a considerable amount of misapprehension and unfounded speculation as to what's in sight. A brief review will dispel most of that.

What the Automotive Committee for Air Defense is to do, is simply to bring together a very considerable number of metal-working firms, primarily from the automotive field, into the business of making pieces and sub-assemblies for large planes, whose design has been selected for standardization and volume output by the United States Government.

The starting point for this pro-

MORE STRENGTH TO MEET STRESS...

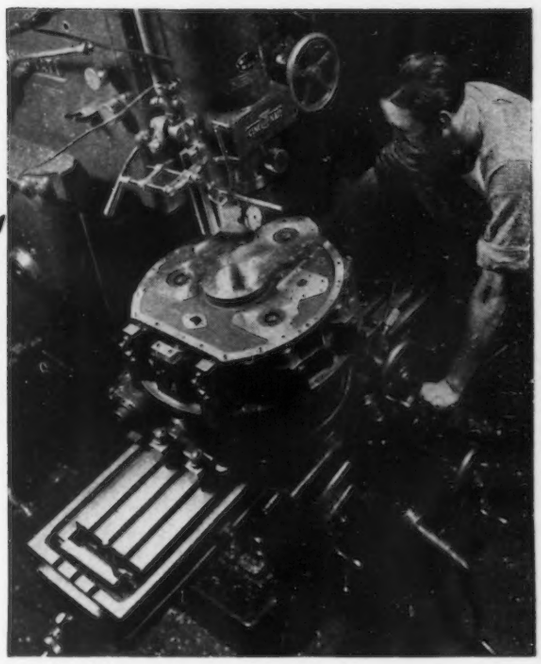
50 *places in a power shovel...*

85 *places in a rock drill...*

275 *places in a milling machine*

NICKEL ALLOY STEELS

Measured by weight, nearly ⅓ of this Bay City power shovel is fabricated from long-wearing Nickel alloy steels. 50 vital parts which must withstand fatigue strains, shock stress and overloads are made of SAE 3135 oil quenched Nickel-chromium steel and other Nickel alloy steels. Frames and bases are Nickel cast steel. "Chabelco" crawler drive chains, Diamond crowd chain, Hercules gasoline and Caterpillar Diesel engines on Bay City shovels also employ high strength Nickel alloy steels for important stressed components.



More than 275 stressed parts in this dial type Cincinnati milling machine are Nickel alloy steels. Nearly 200 of these parts are made of a Nickel-chromium steel, heat treated to high strength yet readily machinable. Parts subject to wear are case-hardened.

Here are five Gardner-Denver rock drills mounted for tunnel driving. In each drill, 85 stressed parts are produced from Nickel alloy steels. The Gardner-Denver Co. writes, "Through increased use of Nickel alloy steels, remarkable improvements in performance and reduction in maintenance costs have been accomplished—without comparable increase in weight or bulk."

• • •

➡ Purchasing and production are often simplified because the versatility of Nickel steels usually permits one Nickel steel to efficiently serve many purposes. Practical answers to your inquiries will be given promptly, based upon our broad experience with many industries. Please address:

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

gram came when the production division of the National Defense Advisory Commission, headed by William S. Knudsen, came up against the conviction that many thousands of the larger airplanes needed by our military forces could not and would not be built in time unless hitherto unutilized production facilities were brought into action promptly. The aircraft industry had expanded phenomenally and was putting on a superlative performance but much more was going to be needed.

Once this was clear, and the concurrence of the military services had been obtained for a program of standardization and volume output, Mr. Knudsen told the automotive industries that he needed their cooperation. He asked that they create a volunteer setup to arrange for a program of parts procurement for huge bombing planes.

It was made clear at the outset that, first, the automotive manufacturers were not going to be asked to design and produce airplanes. Approved designs would be furnished for the parts and responsibility for assembly of the planes would be given to experienced aircraft makers.

Second, contracts for production of parts and sub-assemblies would be placed with the automotive firms not by the Government direct, but by the plane makers holding contracts to deliver the finished planes. The automotive committee would have neither power nor responsibility for placing contracts. Its role would be to an extent comparable to that of the Defense Commission itself, namely: make sure that capacity to perform the assigned jobs was available, and that efficient utilization of manufacturing facilities was made possible.

Third, that aircraft parts suppliers may find themselves under contract to supply two or more assembly plants at the same time. The assemblers will be drawing different units from many scattered sources. So a consultative coordinating service would have to be furnished by the automotive committee as a central source.

There were compelling reasons for getting this volunteer work under way far ahead of the official authorizations for the program:

The metals used and the "bugs" encountered in working them are generally unfamiliar to the great majority of automotive and allied metal-working firms.

Production methods are not established in the sense that automotive production techniques are, and for obvious reasons relatively little work has been done up to the present towards placing this production on a volume basis.

Finally, and most important, the work will have to be acomplished very largely with existing machinery and with little new equipment. Both time and facilities are lacking for development of new machine tools. The job is one of adaptation, which makes a wide farming-out of the work an important time-saving measure.

With these specifications, the automotive committee visualized

ARMOR PLATE or MATCH PLATE

***. . . It's all the same to a* DoALL**

FIRST AID TO OUR DEFENSE PROGRAM

Top illustration shows a DoAll cutting out holes on flask dowels in aluminum match plate for metal patterns. In the circle armor plate is being cut at the rate of 40 square inches per hour.

FASTEST PRECISION METHOD

For cutting internal and external shapes from any metal up to 10" thick. DoAll replaces shaping, milling and lathe work with enormous savings of time, labor and material.

Let a factory trained man bring a DoAll to your plant and show you what it can save you.

FREE—***Handbook on Contour Machining, 158 pages of valuable metal working helps.***

In designing DoAll Defense Tools, DoAll engineers use this big board with drafting machine on an overhead crane.

CONTINENTAL MACHINES, INC.

1311 S. Washington Ave. Minneapolis, Minn.

and undertook an immediate three-point project:

1. To acquaint as many prospective suppliers as possible with the type of work to be done, so they could start figuring on ways and means.

2. To obtain for automotive production men some knowledge and "feel" of aircraft production problems, and the methods of manufacture which have been worked out in the aircraft plants.

3. To survey and list facilities available in the automotive field and related industries so that, once the assemblers are ready to go, they will have before them a thorough "blueprint" of the sources of supply at their disposal.

The time schedule has not been set by the government, but defense needs are all urgent, and manufacturing preparations for volume output must consume a great deal of time. It is for these reasons that the Automotive Committee for Air Defense is on the job now, and seeking the immediate assistance of manufacturers from all fields qualified to do this vitally important defense job for the nation.

Detroit To Hire 75,000 More Workers by Spring

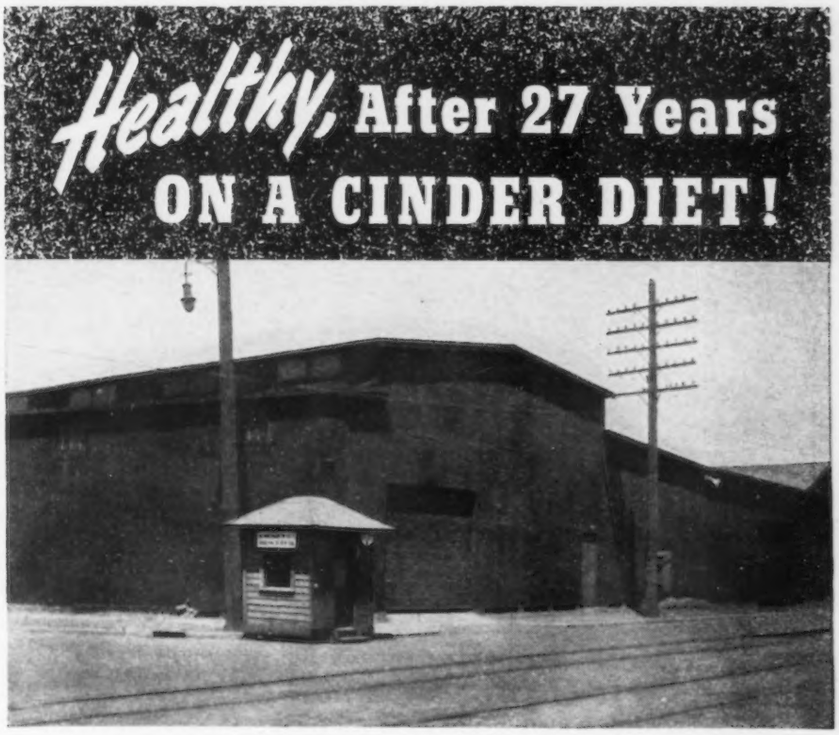
Detroit

• • • **Housing problems** which threaten to beset Detroit when the projects for defense production actually get under way were discussed by two governmental representatives during the week here. George Edwards, director-secretary of the Detroit Housing Commission, told the Council of Social Agencies that there now is a rental vacancy of only 3.7 per cent, including few houses that industrial workers can afford. Quoting the forecast of the Detroit Board of Commerce that 75,000 more workers will get defense and other jobs here by spring, Edwards said that the situation will become acute.

Congressman John Lesinski announced here during the week that an attempt will be made to interest the U. S. Housing Authority in a defense housing project at Wayne, Mich., near Detroit, where two plants shortly will employ 2400 men. The town's population now is less than 5000.

Industrial Gear Sales Off 20% from October High

• • • **Sales of industrial** gears in November, exclusive of automotive gears, fell 20 per cent from the all-time record peak attained in October, but were 37.3 per cent ahead of November, 1939, according to the index compiled by the American Gear Manufacturers Association. The November index was 173, as compared with 216 in October, and 126 in November, 1939. At least part of the decline can be attributed to the fewer days in November. Average index for the first 11 months of 1940 is 149.7, a 45.7 per cent gain over the 102.7 recorded in the same period of 1939. The November index has been exceeded only in the three preceding months of this year since the former high was established in March, 1937.



Fed many times a day by highly corrosive cinders from passing locomotives, this warehouse building leads anything but a comfortable life. In rain and snow and ice, it's the same old story, only worse.

Yet this galvanized ARMCO Ingot Iron roofing and siding continues to protect the building after 27 years of faithful service. It's another glowing tribute to the durability of this highly refined iron!

Used for industrial maintenance, galvanized ARMCO Ingot Iron saves costly repairs and replacements. Then too this lasting metal holds a 34-year reputation for ductility, uniformity, and a full-weight, adherent zinc coating.

Why not see for yourself how galvanized ARMCO Ingot Iron can save money in your industrial applications—or in your products?* Write for complete information. The American Rolling Mill Co., 850 Curtis St., Middletown, Ohio.

**For immediate painting, specify galvanized* ARMCO PAINTGRIP *Sheets.*

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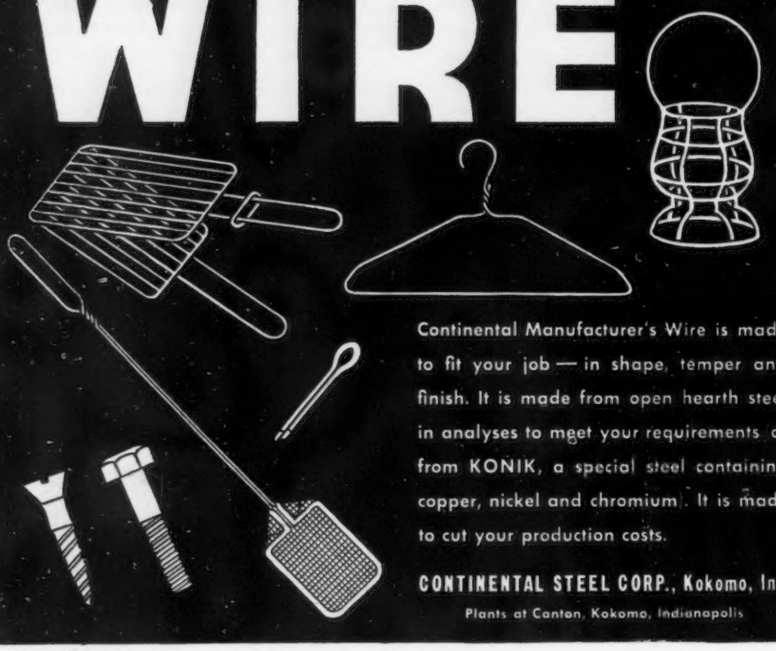
CONTINENTAL

Certified Quality

WIRE



Continental Manufacturer's Wire is made to fit your job — in shape, temper and finish. It is made from open hearth steel in analyses to meet your requirements or from KONIK, a special steel containing copper, nickel and chromium. It is made to cut your production costs.

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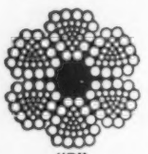
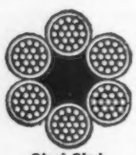
Plants at Canton, Kokomo, Indianapolis

Style B Flattened Strand



"B" Flattened Strand

Wire Rope Center



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You Can Depend On "HERCULES"* (Red-Strand) Wire Rope...

There is no guesswork when you use "HERCULES" (Red-Strand) Wire Rope. It is designed and built to do specific jobs better . . . safer . . . more economically. Furnished in a wide variety of constructions so as to be suitable for all purposes—each backed by 81 years of manufacturing experience and close cooperation with users.

—PREFORMED—

For maximum efficiency in Preformed Wire Rope, use Preformed "HERCULES". It is available in both Round Strand and Flattened Strand constructions.

Made Only By

A. LESCHEN & SONS ROPE CO.

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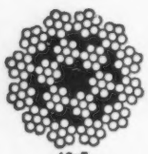
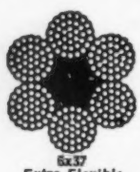


18x7 Non-Rotating

6x19 Filler Wire

6x19 Seale



6x37 Extra Flexible

8x19 Extra Flexible

Illinois Defense Contracts $263,700,802

Chicago

• • • United States Army and Navy contracts amounting to $263,700,802 were awarded to Illinois manufacturers during the period from July 1 to Nov. 30. Of this amount, $232,945,331 was for Army contracts. One of the most recent contracts went to the Borg-Warner Corp., Ingersoll Steel & Disc division, Chicago, amounting to $7,614,630 for artillery ammunition components. Stewart Warner Corp., Chicago, received an order for artillery ammunition components amounting to $1,574,752.

'39 Sales for 8 Auto Companies $2,974,366,192

Washington

• • • Reporting on combined financial returns from eight of the more important automobile manufacturers, the Federal Trade Commission released figures last week estimating total net sales during 1939 at $2,974,366,192; total operating outgo at $2,683,757,210; and a rate of return of 13.3 per cent of the stockholders' investment.

Net income on the average stockholders' equity was placed at $268,160,560 for 1939 after considering income tax payments; and a combined net income for the eight companies of $268,047,382 was reported, after deducting income taxes and profits accruing to minority interests. Cash dividends paid during the year represented a return of about 9.4 per cent to the stockholders on the average ledger value (not market value) of their equity of $2,015,979,396, the FTC reported.

Of the total cost of goods sold, raw materials accounted for 53.5 per cent; production, wages and salaries, 17.6 per cent; other costs, 5 per cent; depreciation and obsolescense covering plant facilities, 4.8 per cent; and finished goods purchased for resale .2 per cent.

Total inventories amounted to $388,447,519 at the start of 1939; $440,621,889 as the year ended or a 14 per cent increase. Of the total inventories, work in process and raw materials increased from $245,649,938 early in 1939 to $290,381,512 at the end of the year. This was an 18.2 per cent increase.

40c. Wage Minimum Urged For Utensil Workers

Washington

• • • **A minimum wage** of 40c. an hour for wage earners in the enameled utensil industry has been recommended to Wage-Hour Administrator Philip B. Fleming by the five-man industry committee whose members include Howard Fawcett, president, Republic Stamping & Enameling Co., Canton, Ohio, and E. G. Gardner, vice-president, National Enameling & Stamping Co., Milwaukee.

After public hearings, to be called at some subsequent date, the recommendations if approved will increase the wages of 1200 employees or approximately 20 per cent of the 6200 workers in the industry, according to figures compiled by the Labor Department's Bureau of Labor Statistics. The figures show the industry comprises 28 plants, 17 of which make enameled utensils as a major product, centered in Ohio, Wisconsin, West Virginia, Pennsylvania and New York.

Continental Steel Increases Wages

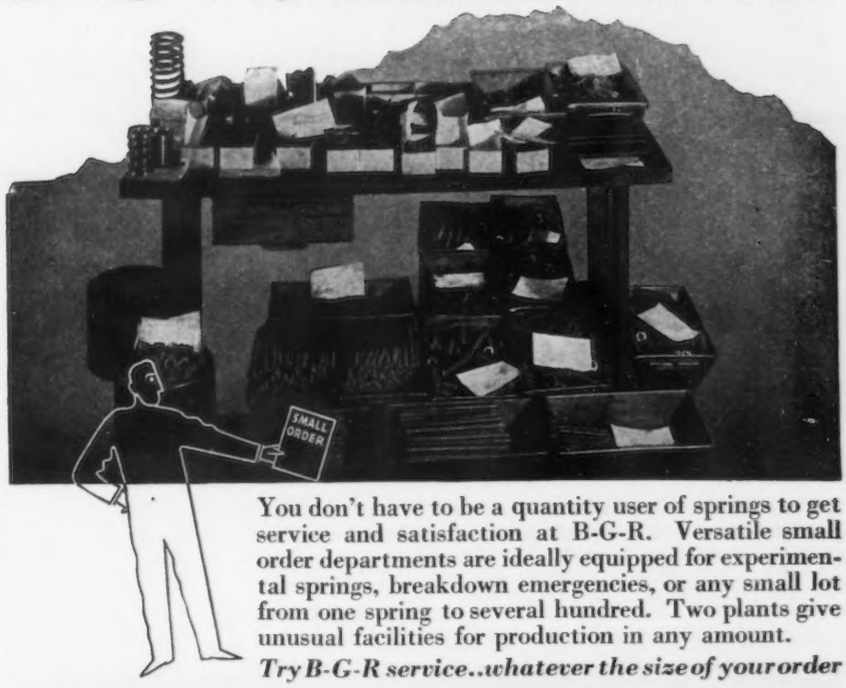
Kokomo, Ind.

• • • **Continental Steel Corp.** and the SWOC have signed a contract increasing the pay of common labor from 55c. to 62½c. an hour, and providing smaller wage boosts to employees now receiving up to 75c. an hour. The step-up to 62½c. conforms to the prevailing minimum in this district under the Walsh-Healy act. Union demands for a closed shop and check-off were rejected by the company. Seniority rights were broadened so that employees in discontinued occupations can be placed in other jobs under certain conditions.

Northwestern Steel & Wire Adds New Electric Furnace

• • • **Northwestern Steel** & Wire Co., Sterling, Ill., has placed a contract for an additional 50-ton top charge electric furnace. This will almost double its present capacity of electrically refined steel for the manufacture of wire products.

B-G-R COMES THROUGH » » »
for the small user of SPRINGS



You don't have to be a quantity user of springs to get service and satisfaction at B-G-R. Versatile small order departments are ideally equipped for experimental springs, breakdown emergencies, or any small lot from one spring to several hundred. Two plants give unusual facilities for production in any amount.

Try B-G-R service..whatever the size of your order

BARNES-GIBSON-RAYMOND
DETROIT PLANT DETROIT, MICHIGAN ← DIVISION OF ASSOCIATED SPRING CORP TWO PLANTS → COOK PLANT ANN ARBOR, MICHIGAN

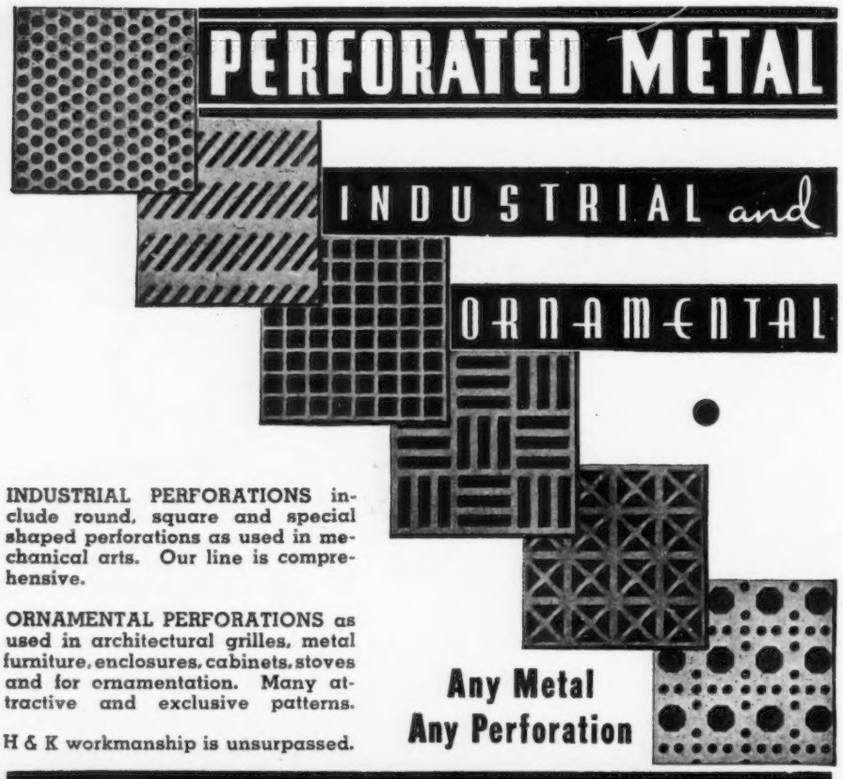
GUSHER COOLANT PUMP

Don't let your cutting tools get hot and bothered in these days of faster speeds and feeds. Cool them and keep them sharp longer by using Gusher Coolant Pumps.

They meet the needs of modern machine tools for either complete flooding of tools or a trickle directed where wanted. Gusher Pumps are packless, clog-free and have long life because grit cannot wear out a Ruthman Pump.

MODEL 11021 MODEL 11022

The RUTHMAN Machinery Company
CINCINNATI, OHIO, U.S.A.



INDUSTRIAL PERFORATIONS include round, square and special shaped perforations as used in mechanical arts. Our line is comprehensive.

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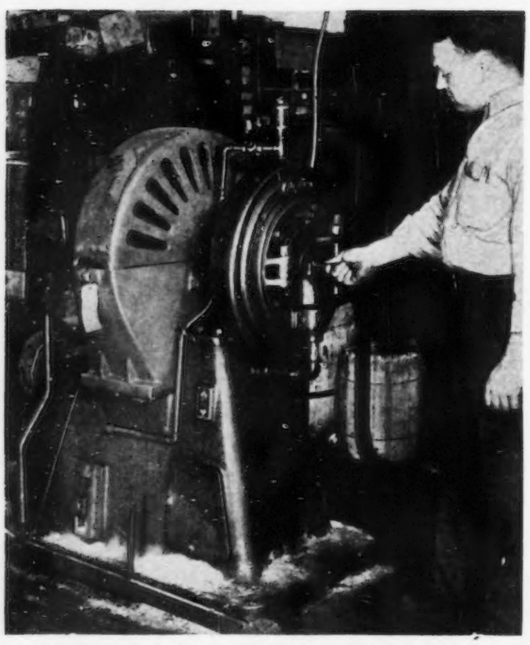
MAKING SAFETY A CERTAINTY *At a Profit* **WITH**

ETNA

SWAGING MACHINES



The Above Photograph Shows a Production Operation That Calls for Dependable Performance—Swaging Fittings On To Flexible Cables for Automobile Brake Assemblies and Airplane Controls—And It Is Profitably and Rapidly Handled With This ETNA SWAGING MACHINE!

● Since putting ETNA Swaging Machines to work on this specific job (which is one that requires outstanding finished product dependability), this manufacturer is making *safety* a *certainty* on every job that leaves his shop—and *at a profit too.* The machine shown here, like every ETNA unit, is a *consistent* performer—the product of more than a quarter century of qualified experience. The ETNA *drum* is of alloy steel securely mounted on the base; *Timken Bearings* carry the main load on the spindle and thrust; the spindle is an alloy steel forging, heat treated and ground; the *hammers, rolls* and *inner ring* are of carefully selected alloys, and the *motor* is mounted on an adjustable bracket. ETNA Swaging Machines are built in capacities of ⅛" to 4" diameter with die lengths 1" to 18". Larger sizes built to order.

WRITE NOW FOR LATEST BULLETINS

THE ETNA MACHINE COMPANY
3400 Maplewood Ave. Toledo, Ohio

Necessity Certificate Application Due Jan. 7

Washington

• • • **The National Defense** Advisory Commission has fixed Jan. 7 as the date on which manufacturers should submit applications for certificates required under the amortization deduction provisions of the new defense tax law. Applications will be received during the 30-day period thereafter and it was emphasized that every effort will be made to dispose of them as promptly as possible.

The commission announcement refers to all applications for a "necessity" certificate with respect to any facility, the construction of which already has been begun or which has already been acquired; and a certificate of government protection or a certificate of non-reimbursement in connection with a contract which was executed more than 90 days before the statutory deadline.

The new tax law permits a deduction for income and excess profits tax purposes for amortization over a five year period on any emergency facility completed or acquired after June 10, 1940, provided a certificate is obtained from the War or Navy Departments. Such certificates, however, must be issued before Feb. 5, 1941, before the start of construction or the date of acquisition, whichever is later. The "certificate of government protection" and "certificate of non-reimbursement" must be made before Feb. 6, 1941, or within 90 days after the execution of the contract, whichever is later.

Notice of the procedure already had been sent to contractors with the warning that unless applications were filed in sufficient time it would not be possible to act upon them within the statutory period. Applications, nevertheless, have lagged.

Notice of procedure and instructions for the preparation of applications may be obtained from the Office of the Assistant Secretary of War (Purchase and Contract Branch), Washington, or from the Office of the Judge Advocate General of the Navy, Navy Department, Certification Unit, Washington.

R.F.C. Defense Loans Rise to $26 Millions

Washington

• • • **The Reconstruction Finance Corp. reported last week that RFC loans for defense purposes during November totaled $11,632,998, bringing the total amount for defense loans to $26,004,213 to date. Loans for business enterprises during the month aggregated only $854,179, the RFC said.**

"Millites" Permit Night Inspection of Billets

Pittsburgh

• • • **Enabling night-time** inspection of steel billets to be carried on for the first time, 96 Westinghouse "millites" installed in the chipping room of a large mid-Western steel mill have raised the seeing level in that area from 10 to 60 footcandles, and eliminated a production bottleneck, according to Westinghouse Electric & Mfg. Co.

Open type luminaries used in this billet chipping room were continually handicapped by dirt and grime collecting on their reflectors, reducing light output to such a degree that chipping and inspecting could not be carried on at night, it is said. This work, even during daylight hours, made frequent cleaning of the reflectors necessary, and being open luminaires, the cleaning required quite some time on the part of the maintenance department.

Westinghouse "millites" installed to replace the open-type units, are enclosed units, with clear glass lenses, and are dust-tight. Installed at 12 x 12 ft. spacings, and mounted 40 ft. above the floor of the room, each unit uses a 1000-watt incandescent lamp.

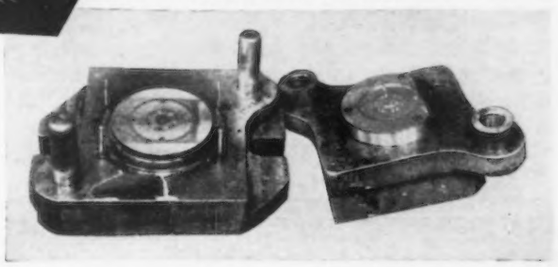
3 New Gas Engines Announced By Caterpillar Tractor

Peoria, Ill.

• • • **Three new models** of heavy-duty natural gas engines with combination gas-gasoline carburetors have been announced by Caterpillar Tractor Co. Fuel systems have a gas filter with regulator to handle gas pressure up to 150 lb. Engines are four and six cylinder sizes.

LUX CLOCK MANUFACTURING CO. MAKES ACCURATE CLOCK PARTS

with JESSOP'S WINDSOR SPECIAL AIR HARDENING DIE STEEL



Male and female sub-press die for blanking synchronous motor field plates from 2% silicon steel, .050" thick. Photo courtesy Lux Clock Mfg. Co., Waterbury, Conn.

The tool illustrated is one of three dies made of Jessop's WINDSOR SPECIAL Air Hardening Die Steel by the Lux Clock Mfg. Co., Waterbury, Conn., for use in the production of clock parts. According to Mr. Fred Lux, Works Manager, these dies were heat treated without any change that they were able to measure.

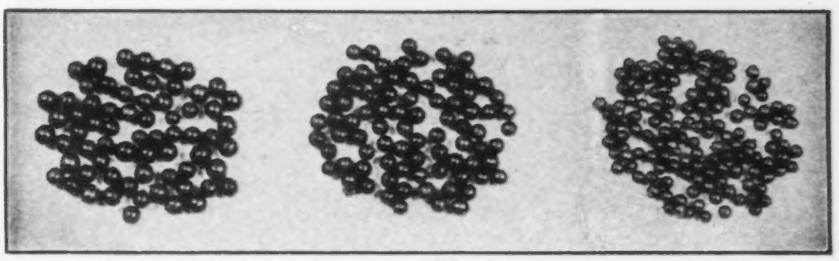
WINDSOR SPECIAL is a new die steel recently developed by Jessop for use where the initial cost of the tool or die must be held to a minimum. In addition to its non-deforming qualities, it is easily machined, extremely tough and has a wide hardening range. Write today for a free copy of our new folder which gives working data and physical properties.

JESSOP STEEL CO., 537 Green St., Washington, Pa., Est. 1901

JESSOP STEEL CO. MADE IN AMERICA FINE JESSOP STEELS WASHINGTON, PA.

Jessop Steels of America

CARBON- HIGH SPEED- SPECIAL ALLOY STAINLESS and COMPOSITE STEELS



HEAT-TREATED STEEL SHOT

We manufacture shot and grit for endurance

A shot or grit that will blast fast with a clean finish.

This is the only reason why so many operators are daily changing to our shot and grit, from Maine to California.

The unprecedented demand for our—

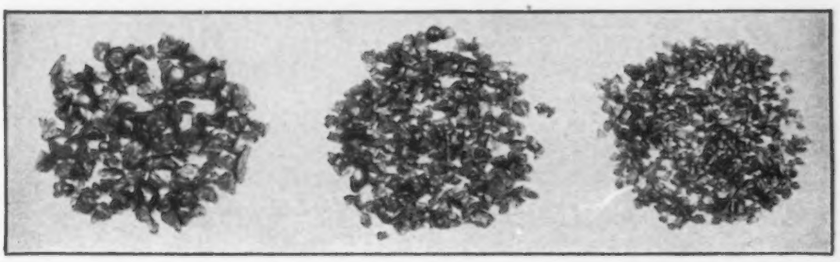
Heat-Treated Steel Shot and Heat-Treated Steel Grit

has enabled us to expand our production and maintain a quality that is more than satisfactory to our hundreds of customers all over the country.

HARRISON ABRASIVE CORPORATION

MANCHESTER, NEW HAMPSHIRE

HEAT-TREATED STEEL GRIT



Union Carbide Builds Large Plastics Plant

• • • **Plans for immediate** construction of a plastics plant costing several millions of dollars, which will be one of the largest plastics production units in the country, have been announced by officials of Union Carbide & Carbon Corp., New York.

The plant, to be built at Bound Brook, N. J., will be used for the manufacture of "Vinylite" plastic, the new chemical creation is finding hundreds of applications in such diverse fields as clothing, food packaging and heavy industry. "Vinylite" plastic is produced from vinyl resins and is a compound of vinyl chloride and vinyl acetate. Both of these are made directly from natural gas, salt, coke, limestone, air and water.

The new plant will adjoin the plant of Bakelite Corp., another unit of Union Carbide & Carbon Corp.

The building will be 580 x 250 ft., and will be built on a 200-acre tract. Construction will be begun before the end of the year, and the plant is expected to be completed within eight to nine months.

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Willys to Make Light Cars for U. S. Army

Toledo, Ohio

• • • **Preparations for** manufacture of 1000 light reconnaissance cars for the army by Willis-Overland Motors, Inc., will begin at once, it was announced by Joseph W. Fraser, president. The $1,500,000 car order follows closely upon an order for $8,750,000 of shell cases and forgings.

Mr. Fraser said the production would get under way about March 15. Some tooling and assembly arrangement will be required preliminary to the operations. The 80-in. wheelbase, 4-wheel drive cars are to be powered with the Willys commercial engine which develops 61 hp. at 3800 r.p.m. A special transmission lever provides a 2-to-1 gear reduction, giving in effect six speeds forward and two reverse.

Briggs Lifts Wage Rate By 2c. An Hour

• • • **Between 17,000** and 18,000 employees at Briggs, supplier of Chrysler bodies, will get a $680,000 Christmas bonus on the same basis as the Chrysler bonus, that is, $40 for every worker with one year's seniority (see Assembly Line). Briggs employees also will obtain a 2c. an hour increase amounting to an annual pay boost of $400,000. Announcements made simultaneously by the company and UAW Friday afternoon terminated the shortest collective bargaining session in the history of the automobile industry. The session started at 10.30 a. m. Friday and the agreement was ratified three hours later by the negotiators subject to approval by union members.

T.C.I. Gives Contract For 73 Coke Ovens

Birmingham, Ala.

• • • **Contract has** been awarded for erection of a battery of 73 coke ovens at the Fairfield Works of Tennessee Coal, Iron & Railroad Co. The contract, it was learned, was awarded to The Koppers Co., Pittsburgh.

These ovens are a part of the general expansion program of the Tennessee company announced on Nov. 13. They will be erected adjacent to the existing coke oven batteries and will be known as battery No. 4. Work is expected to be completed within 10 months. When these ovens have been completed there will be a total of 436 ovens at the Fairfield plant, having capacity for the production of 2,330,000 net tons of coke annually. In addition to the coke ovens, certain equipment will be added to the present by-product plant.

Beehive Coke Plant To Be Modernized

Pittsburgh

• • • **The Dearth coke** plant in the Connellsville district, inactive for many months, has been leased from the H. C. Frick Coke Co., by Frank Crow, Jr., and Lawrence Parshall, both of Uniontown, Pa., in cooperation with the Wieman & Ward Co., Pittsburgh.

When fully modernized the property will have an annual capacity of 200,000 tons of low phosphorous, low sulphur beehive coke, according to Mr. Ward, president, Wieman & Ward.

Building of By-Product Coke Plant Studied

Pittsburgh

• • • **Pittsburgh Steel Co.** and Pittsburgh Coke & Iron Co. are contemplating a joint construction of a by-product coke plant at Monessen, Pa., on land recently acquired from Carnegie-Illinois Steel Corp. No definite contracts have been let nor has any final decision been made concerning the construction of this plant which, if completed, will provide for about 36,000 tons of by-product coke a month. This would be sufficient to take care of Pittsburgh Steel Co.'s coke needs, a substantial portion of its requirements of gas, and its entire requirements for fuel tar.

Steel Wages Reach New High at 85½c

• • • Steel wages in 1940 are the highest in the history of the industry and are among the highest paid by any manufacturing industry in the country according to a study by the American Iron and Steel Institute of data published by the United States Department of Labor and other statistical-gathering agencies.

Since May of this year, steel workers have earned an average of 85½c. an hour, or nearly 2 per cent more than the previous peak of 84.2c. an hour earned during 1939, and 30 per cent above the average of 65.4c. paid in 1929.

The hourly earnings of wage earners in the steel industry in recent months stand fully 28 per cent higher than the average hourly wage in all manufacturing industries, as reported by the Department of Labor. Since May the average hourly earnings of workers in all manufacturing industries are reported at 67c. an hour.

Of the approximately 90 industries covered by the government's reports, the workers in only six industries currently receive a higher average hourly wage than do steel employees. Those six are: the automobile, beverage, newspaper printing, petroleum refining, rubber tire and shipbuilding industries.

Fayette Fuel Co. Leases 143 Frick Coke Ovens

Uniontown, Pa.

• • • **The Fayette Fuel Co.** here has leased 143 beehive coke ovens from the H. C. Frick Coke Co. and will begin operation soon in order to supply additional beehive coke.

Carnegie-Illinois Rebuilds Carrie Stack

Pittsburgh

• • • **Carnegie-Illinois** Steel Corp. is to rebuild a second blast furnace at its Carrie Works, Rankin, Pa., as soon as the present campaign is completed. Capacity will be increased to 1100 net tons annually. Construction work on this furnace will be undertaken by H. A. Brassert & Co., Pittsburgh.

National To Rebuild 2 Blast Furnaces

• • • **National Steel** Corp. is contemplating construction of a blast furnace and 64 coke ovens at Weirton, W. Va., and has already approved a program increasing the company's pig iron capacity by 420,000 tons a year through the rebuilding of two blast furnaces at Detroit and Buffalo, N. Y., Ernest T. Weir, National Steel chairman, said this week.

While no direct increase in ingot-making capacity is planned by National Steel, the company's steel production will be increased by addition of pig iron and coke capacity, Mr. Weir said. In addition National Steel has programmed at Weirton the conversion of the continuous strip mill to permit the making of either hot rolled strip or structural shapes alternately, which would give the company three mills available to handle the rapidly increasing demand for structural shapes.

Four months will be required to place a rebuilt stack at Buffalo (Hanna Furnace Corp.) into production. Increased demand of foundries for pig iron is one reason for rebuilding of this furnace. Hot metal, it is understood, will be provided by Bethlehem Steel Co.'s Lackawanna plant.

Mr. Weir said that steel demand has tapered in December, that 10 per cent of his company's output is for export, and that the industry's capacity for making steel is ample both for civilian and defense needs. It would be uneconomical, he indicated, for the steel industry to carry a productive capacity not needed in peace time.

Gulfsteel Division Sets Output Record

Gadsden, Ala.

• • • **In 11 months** of 1940, Republic Steel Corp.'s Gulfsteel Division shattered its previous steel production records for a full year. During the first 11 months of this year, E. I. Evans, district manager, said the division had produced 475,000 tons of ingots. Former record of 376,000 was set in 1939.

The Gulfsteel plant, Evans said, expected to produce 50,000 tons during December and had hopes of producing 600,000 tons in 1941.

Steel Industry Still Sees No Need for "Wasteful" Expansion

Washington

The insistence of those who maintain that there is need for additions to the American steel capacity is not tenable and does not reflect the careful study that the question requires, prominent members of the industry again assert.

Reviewing the situation sources in the industry declare that the rated annual ingot capacity of 83,000,000 net tons is in excess of 10 times the defense needs, which are estimated at not more than 8,000,000 tons in any one year. The capacity is held to be more than five times the combined requirements for defense and aid to Great Britain, which, with Canada, is taking American steel at the annual rate of 9,000,000 tons of ingots.

The total of 17,000,000 tons for American defense and British requirements, it is pointed out, leaves 66,000,000 tons for regular domestic commercial use and exports to other than British countries. These latter exports are moving at the rate of approximately 2,500,000 tons a year. This leaves 63,500,000 tons for domestic consumption or fully 25 per cent above the average domestic consumption of steel during the past decade.

In reply to the contention that peak civilian demands of 1929 will be surpassed the answer is made that much of the requirements of that period were not economically sound.

Taxes and diversion of man power and materials to defense needs, it is claimed, will restrain any fantastic increase of the production and sale of consumer goods. The automobile industry, for instance, engaged with some of its facilities and labor in making defense requirements, cannot considerably increase its output of passenger cars.

Regarding the matter of providing for a theoretical peak of temporary civilian demands through deficit spending, it is explained that the crest of such demand might be past before large scale steel expansion can be accomplished. The result, it is pointed out, would be waste of money, materials and labor which are vitally needed for defense purposes.

Running at capacity in 1941 the industry can add 16,000,000 tons to this year's production. It is also pointed out that new coke, blast furnace, steelworks and electric furnace units are under construction or have been announced. To assure ample electric furnace steel, urgently needed for defense production, the expansion of fully 50 per cent has been pointed to while within the past few weeks the addition of nearly 1,300,000 tons of open hearth steel capacity has been announced.

An ironic twist is seen in the present cry of steel shortage, for it comes from the self-same "economists" who until recently criticized the steel industry for its surplus capacity and accelerated productive ability made possible by technological developments.

The industry has made it clear that it is imposing no limits on defense needs and is prepared to continue expansion and improvements that are dictated by real needs and sound judgment. But it does not think that at present it would be in the national interest to expand wastefully.

Photo by International

INDUSTRY CARRIES ON: This photograph shows a blacksmith's shop in England struck by Nazi bombs. Finding his forge undamaged, the smithy works on.

Weldtronic Corp. Expands

• • • Typifying the rapid growth of electrical resistance welding, Weltronic Corp., manufacturer of resistance welding controllers and general purpose timers, is moving into a new plant now nearing completion on East Outer Drive, Detroit, according to an announcement of C. J. Collom, general manager. The building is of modern design with approximately 8700 sq. ft. of floor space and has provisions for enlargement.

CONGRESS OF INDUSTRY: Walter D. Fuller (top right), president of the Curtis Publishing Co., was elected president of the National Association of Manufacturers at last week's annual meeting of the NAM. With Mr. Fuller is Henning W. Prentis, Jr., president of Armstrong Cork Co., and retiring president of NAM. Other industry leaders pictured at the NAM meetings are (second photo from top of page, left to right), James H. Rand, Jr., president, Remington Rand, Inc.; H. L. Derby, president, American Cyanamid & Chemical Corp., and Philip D. Reed, chairman, General Electric Co. In the third photo from top (left to right), are W. S. S. Rodgers, president, Texas Co., and Tom M. Girdler, chairman, Republic Steel Corp. In the bottom photo are John D. Cunningham, president, Republic Flow Meters Co., left, and Dr. Elvin Killheffer, of the Du Pont company.

U. S. Industry, Labor Not Sold On Defense Need, Knudsen Says

• • • **Defense production,** particularly of airplanes, is lagging because U. S. industry and labor have not yet been fully sold on the serious side of the job, William S. Knudsen declared last week at the annual dinner of the National Association of Manufacturers at New York.

Warning his audience that he was not "trying to paint the lily" by being unduly optimistic about progress of defense efforts, Mr. Knudsen said the Defense Commission earnestly "requests industry to speed up deliveries by 20 per cent."

Hoped-for production of planes by Jan. 1 must be scaled down 30 per cent, and estimates of the commission and of aircraft manufacturers last July will not be met, the defense commissioner said. "Guns and machine guns are still in the tooling stage except for such capacity as was ready before we started, and four light tanks are being produced daily with medium tanks to be available from

six plants by summer," Mr. Knudsen said.

"The machine tool industry has set a very good example of speeding up before us and it is about the way other items will have to proceed if we are going to make time," the manufacturers were told.

Mr. Knudsen pleaded for "full-time operation of all machines" and cited the Friday-to-Monday blackout. "We can train the men to operate it," he said. "Isn't it possible to put the defense job on a war basis, even if we are at peace?"

The manufacturers were told that defense industries are 20 to 25 per cent tooled up, can be 80 per cent tooled up by April 1 and fully tooled up by May 31.

The billions of dollars of contracts awarded under the defense program, Mr. Knudsen said, means, in units; 50,000 airplanes, 130,000 engines, 17,000 heavy guns, 25,000 light guns, 13,000 trench mortars, 33,000,000 loaded shells, 9200 tanks, 300,000 machine guns and ammunition, 400,000 automatic rifles and ammunition, 1,300,000 regular rifles and ammunition, 380 Navy ships, 200 mercantile ships, 210 camps and cantonments, 40 government factories, clothing and other equipment for 1,200,000 men. These quantities include British and foreign material.

"Every defense contractor holder should be informed of idle facilities in the locality so as to confine the new equipment as far as possible to special machinery," he said. "Have we done everything we can to utilize existing facilities and offer them to companies having defense contracts? Can we subcontract more of our work and spread it so as to make speed, and more speed that way?"

How Aircraft Industry Views Production Lag

• • • **Delays and** shortages outlined by Defense Commissioner William S. Knudsen as holding back plane production are not of the aircraft industry's making, Col. John H. Jouett, president of the Aeronautical Chamber of Commerce of America, said.

"The industry will welcome suggestions or measures on the part of the government which will permit further acceleration of production effort now restricted by factors beyond our control." Mr. Jouett said. "These include completion of new facilities, increase of sources and volume of machinery and supplies and legal limitation on working hours.

Navy Plans Ordnance Plant At Detroit

Detroit

• • • **Word was received in Detroit, Saturday, that the Navy will erect here an ordnance plant to produce all types of ordnance equipment, including guns. The plant will cost about $12,000,000 and is one of four to be erected. The plant is to be operated by a private firm, it is understood.**

Speed Up Machine Tool Deliveries, Knudsen Says

Washington

• • • **William S. Knudsen,** head of the production division of the National Defense Advisory Commission, told machine tool builders in a letter early this week that delivery on tools must be speeded up in order to increase production during 1941.

In a letter directed to the National Machine Tool Builders Association, Mr. Knudsen congratulated the industry on the "remarkable achievement" accomplished so far, but warned that more speed is necessary and that not enough builders are expanding plants, running two and three shifts a day or sub-contracting for parts.

"If you could see as I do from the inside," Mr. Knudsen said, "the terrible urgency of the situation, you would agree with me that I am not asking too much in requesting that you use every conceivable effort to speed up delivery and increase the production of machine tools during 1941."

The former president of General Motors sent an accompanying letter in which he urged employees in the industry "to put everything you have without stint into your job."

Scrap Stocks 4% Higher At End Of September

Washington

• • • **Reflecting an** increase of 4 per cent, the Bureau of Mines reports that domestic stocks of iron and steel scrap at consumers' and suppliers' plants and in transit at the end of September approximated 6,993,000 gross tons, compared with 6,750,000 tons at the end of June. Virtually unchanged from the position at the end of the second quarter, known stocks at the end of the third quarter were equivalent to an eight weeks' supply at the rate of the September consumption. September scrap consumption totaled 3,922,000 tons. Of this total, 1,703,000 tons was purchased and 2,219,000 tons was home scrap. Stocks at the end of September consisted of 5,232,000 tons of purchased and 1,761,000 tons of home scrap.

Pig iron stocks at the end of the third quarter totaled 3,372,000 tons, compared with 3,593,000 tons at the end of the second quarter. Consumption in September amounted to 3,692,000 tons.

Central Steel & Wire Adds 200 x 600 ft. Warehouse

Chicago

• • • **A 200 x 600 ft.** warehouse unit and a one story office building are being added to the plant of Central Steel & Wire Co. Accommodations for 20 railroad cars and for 50 motor trucks at one time will be provided in the new building which will be completed about March 15. The office unit will be air-conditioned, illuminated with indirect fluorescent lights and will have acoustically treated ceilings.

Arms-Franklin Corp. To Make Tank Parts

• • • **Arms-Franklin Corp.,** Franklin, Pa., which is expected to go into production of tank parts for the United States and British governments early in 1941, will employ about 300 persons. This company, formerly known as the Franklin Valveless Engine Co., has orders totaling $120,000, according to Myron I. Arms, president, assuring continuous operation for nine months.

Contract Placed for Brazil's Steel Plant

Cleveland

• • • **Arthur G. McKee & Co.**, engineers and contractors of Cleveland, announce receipt of a contract from the Commisaõ Executiva do Plano Siderurgico Nacional for the design and supervision of construction of a complete iron and steel plant to be built near Rio de Janeiro, Brazil. The plant will be built upon general plans previously prepared by this Brazilian commission. The plant will consist of coke ovens, a blast furnace of 1000 tons daily capacity, open hearth steel furnaces with an annual capacity of about 350,000 tons, and rolling mills for producing a complete range of rolled steel products from heavy semi-finished steel, rails and structural materials, to finished sheets and tin plate.

Iron ore of very high quality is available within 300 miles of the plant site. Coal will come from mines in the state of Santa Catherina, supplemented by coking coal from the United States.

The cost of the plant will be about $36,000,000 of which $20,000,000 has been made available by a loan from the U. S. Export-Import Bank to Brazil. The total capitalization of the operating company will be about $45,000,000. Materials and equipment will come largely from the United States. It is estimated that two and one-half to three years will be required for completion of this plant.

Other foreign contracts of the McKee company include provision for increase in capacity and improvements in the plants of the three principal iron and steel manufacturing companies in Canada, and extensions to oil refineries in Trinidad, British West Indies.

Contracts Given for 3900 Defense Housing Units

Washington

• • • **Contracts for 3900** defense housing units to cost $11,705,000 were awarded last week by the Public Building Administration of the Federal Works Agency. Locations, contractors, amounts involved and other details follow:

San Diego, Cal.—3000 units to cost $9,070,000. Awarded jointly to McNeil Construction Co., and Zoss Construction Co., both of Los Angeles. Allocation has been made out of the $150,000,000 provided by the Lanham Housing Act.

El Paso, Tex.—200 units at Ft. Bliss to cost $612,000. Contract awarded H. T. Ponsford & Sons, El Paso.

Denver Col.—50 units to cost $172,000 at Ft. Logan. Contractor is F. J. Kirchhof Construction Co., Denver.

Tampa, Fla. — 300 units near MacDill Field to cost $816,000. Contractor is Paul Smith Construction Co., Tampa.

Columbus, Ga.—350 units near Ft. Benning to cost $1,035,500. Contract awarded Murphey Pound of Columbus.

Funds for the projects at El Paso, Denver, Tampa and Columbus are covered by an allocation of $45,762,500 from the War Department to the Federal Works Agency.

Harris Products Opens Cleveland Plant

• • • **With the opening** of a new plant in Cleveland, Harris Products Co., of Detroit, moves the major portion of its production of Torflex rubber and Neoprene backed bushings to Ohio and at the same time establishes a branch sales office there, according to announcement by R. G. Bradley, general manager. Some manufacturing facilities will still be maintained at Detroit, where engineering design, development and testing capacities are being enlarged.

The new plant which is located at 5105 Cowan Avenue, Cleveland, has a capacity at the present time of 30,000 Torflex bushings per day which can be increased to approximately 100,000 bushings per day without extensive additions or equipment.

Wright Awards Contract For 33-Acre Engine Plant

• • • **Wright Aeronautical Corp.** has awarded a construction contract for a factory and assembly plant to contain 33 acres of floor space at Lockland, Ohio. Frank Messer & Sons, Cincinnati contracting firm, got the contract, which was described by Albert Kahn, Detroit architect, as the largest building award ever let under one contract in the U. S.

Myron B. Gordon, Wright vice-president, said construction would begin immediately and the first portion be ready for occupancy next spring. The factory and assembly plant will cover about 1,400,000 sq. ft. and have overall dimensions of 1064 x 1320 ft.

Shipments of U. S. Steel Subsidiaries Decline in November

Month	1936 Shipments	1936 Per Cent of Capacity*	1937 Shipments	1937 Per Cent of Capacity*	1938 Shipments	1938 Per Cent of Capacity*	1939 Shipments	1939 Per Cent of Capacity*	1940 Shipments	1940 Per Cent of Capacity*
January	795,214	44.8	1,268,403	75.4	570,264	33.7	870,866	51.8	1,145,592	69.8
February	747,375	45.3	1,252,845	82.5	522,395	35.5	747,427	49.3	1,009,256	65.8
March	863,946	50.5	1,563,113	92.7	627,047	37.2	845,108	50.4	931,905	56.8
April	1,080,667	63.2	1,485,231	91.0	550,551	33.7	771,752	47.5	907,904	57.1
May	1,087,395	63.4	1,443,477	85.5	509,811	30.2	795,689	47.4	1,084,057	66.0
June	978,030	57.1	1,405,078	85.8	524,994	32.1	807,562	49.7	1,209,684	76.1
July	1,050,085	61.3	1,315,353	77.9	484,611	28.8	745,364	44.5	1,296,887	79.2
August	1,019,882	59.6	1,225,907	72.6	615,521	36.3	885,636	52.7	1,455,604	88.6
September	1,060,708	62.0	1,161,113	71.1	635,645	37.5	1,086,683	66.9	1,392,838	87.8
October	1,108,973	62.6	875,972	52.0	730,312	43.1	1,345,855	79.9	1,572,408	95.8
November	974,292	59.2	648,727	39.7	749,328	45.6	1,406,205	86.1	1,425,352	89.6
December	1,178,598	68.8	539,553	32.1	765,868	45.2	1,443,969	85.8		
Yearly adjustment	(—)40,163	...	(—)87,106	....	(+)29,159	...	(—)44,865	...		
Total for year	11,905,002	58.2	14,097,666	70.4	7,315,506	36.1	11,707,251	59.4		

* Rolled and finished steel capacity.
Shipments are in net tons.

Government Awards . . .

Government contracts for the week ended Dec. 16 as reported by the Division of Public Contracts, Department of Labor.

Iron and Steel Products

Air Cruisers, Inc., Clifton, N. J.; oxygen cylinders, $252,797.

Akron-Selle Co., Akron; steel supports, $10,352.

Baldt Anchor, Chain & Forge Corp., Chester, Pa.; chain, $14,977.

Berkley Mach. Wks. & Foundry Co., Inc., Norfolk, Va.; steel tubes, $20,600.

Bethlehem Steel Co., Cincinnati; steel towers, $35,800.

Boyle Mfg. Co., Los Angeles; steel drums, $54,088.

Braeburn Alloy Steel Corp., Braeburn, Pa.; steel, $20,499.

Edward G. Budd Mfg. Co., Philadelphia; body assembly, $847,443.

Edward G. Budd Mfg. Co., Philadelphia; metal parts, $18,157.

Jabez Burns & Sons, Inc., New York; coffee roaster, $17,700.

Camden Forge Co., Camden, N. J.; racks and pinions, $240,860.

Camillus Cutlery Co., New York; jack knives, $24,068.

Chicago Flexible Shaft Co., Chicago; blades, $23,154.

Commercial Shearing & Stamping Co., Youngstown, Ohio; super-struc. hoist, $49,189.

Copperweld Steel Co., Glassport, Pa.; copper wire, $18,630.

C-O-Two Fire Equipment Co., Newark, N. J.; gas cylinders, $21,072.

Crane Co., Washington; valves and cocks, $86,082.

Crown Iron Works Co., Minneapolis; screw posts, $20,894.

Crucible Steel Co. of America, New York; forgings, $26,875.

Cyclone Fence Co., Waukegan, Ill.; fence, $29,830.

Dayton Wheel Co., Dayton, Ohio; reel cart, $31,093.

Dicke Tool Co., Inc., Downers Grove, Ill.; reel unit, $146,646.

Eastern Tool & Mfg. Co., Bloomfield, N. J.; wire assemblies, $43,500.

Edgcomb Steel Co., Philadelphia; drawn steel, $99,384.

Enterprise Foundry Co., San Francisco; stretcher weights, $13,800.

Estate Stove Co., Hamilton, Ohio; ranges, $87,950.

Ever-Tite Mfg. Co., Davenport, Iowa; radio cabinets, $32,200.

Fairmount Tool & Forging Co., Cleveland; motor main. equip., $11,731.

A. B. Farquhar Co., Ltd., York, Pa.; buoys, $29,775.

Federal Equipment Co., Carlisle, Pa.; lock boxes, $19,791.

Charles Fischer Spring Co., Brooklyn, N. Y.; rifle parts, $55,929.

Froiland Mfg. Co., Springfield, Mass.; mast base, $61,527.

General Drop Forge Co., Inc., Buffalo; forgings, $10,065.

James Gorsuch, Jr., Jeffersonville, Ind.; grates, $73,500.

Graver Tank & Mfg. Co., Inc., East Chicago, Ind.; mooring buoys, $61,400.

Graybar Electric Co., Knoxville, Tenn.; steel conduit, $11,781.

Grove Regulator Co., Oakland, Cal.; valves, $10,360.

Louis Hanssen's Sons, Davenport, Iowa; hardware, $11,103.

Hart Mfg. Co., Louisville, Ky.; ranges, $38,428.

Hart Manufacturing Co., Louisville, Ky.; ranges, $133,155.

Heller Bros. Co., Newark, N. J.; files, $20,114.

Hemp & Co., Inc., Macomb, Ill.; fin. assemblies, $76,959.

Horton Mfg. Co., Bristol, Conn.; mast sections, $159,251.

Independent Engineering Co., Inc., O'Fallon, Ill.; oxygen cylinders, $145,800.

Ingersoll-Rand Co., New York; drills, hammers, $54,637.

International Silver Co., New York; knives, $37,200.

Karp Metal Products Co., Inc., Brooklyn, N. Y.; radio cabinets, $21,704.

O. C. Keckley Co., Chicago; comp. valves, $11,490.

Walter Kidde & Co., Inc., New York; cylinder assys., $127,907.

F. A. Klaine Co., Cincinnati; ranges, $47,982.

Lakeside Bridge & Steel Co., Milwaukee; gantry crane, $198,750.

Lalance & Grosjean Mfg. Co., Washington; kitchen utensils, $11,699.

Larson Tool & Stamping Co., Attleboro, Mass.; angletube assy., $116,024.

La Salle Steel Co., Chicago; cold drawn steel, $189,752.

Louisville Tin & Stove Co., Louisville, Ky.; spark arresters, $34,000.

Lufkin Rule Co., Saginaw, Mich.; caliper, $14,070.

Lukens Steel Co., Coatesville, Pa.; trunnion blocks, $64,314.

Mann Edge Tool Co., Lewistown, Pa.; axes, $22,537.

Midvale Co., Washington; racks and pinions, $239,600.

Midway Electric Supply Co., Inc., New York; conduit pipe, $114,189.

Mosler Safe Co., Hamilton, Ohio; safes, $30,817.

National Can Corp., Boston; hose guards, $10,908.

National Enameling & Stamping Co., Granite City, Ill.; steel drums, $88,720.

National Forge & Ordnance Co., Irvine, Pa.; forgings, $139,633.

National Malleable & Steel Castings Co., Cleveland; cast chain, $131,939.

National Pneumatic Co., Inc., New York; shell parts, $154,020.

Oil Well Supply Co., Oil City, Pa.; metal parts, $246,262.

Phillips & Buttorff Mfg. Co., Nashville, Tenn.; stoves, $90,382.

Phillips Pump & Tank Co., Cincinnati; portable tanks, $15,841.

Phoenix Manufacturing Co., Joliet, Ill.; horse shoes, $19,673.

Pittsburgh Valve & Fittings Corp., Barberton, Ohio; bronze valves, $48,794.

Pratt Industries, Inc., Frankfort, N. Y.; tubes, $263,241.

G. E. Prentice Mfg. Co., New Britain, Conn.; clasps, $28,050.

Robertshaw Thermostat Co., Youngwood, Pa.; booster parts, $79,719.

Joseph T. Ryerson & Son, Inc., Chicago; reinforce. bars, $12,743.

Scheu Products Co., Upland, Cal.; grate bases, $25,375.

Schmitt Steel Company, Portland, Ore.; anchor jacks, $31,450.

Southwest Welding & Mfg. Co., Alhambra, Cal.; mooring buoys, $183,200.

Star Drilling Machine Co., Akron, Ohio; drawbars, $21,402.

L. S. Starrett Co., Athol, Mass.; caliper, $20,943.

Steel Improvement & Forge Co., Cleveland; forgings, $56,806.

Surface Combustion Corp., Toledo; heat unit, $68,000.

Tredegar Co., Richmond, Va.; projectiles, $42,224.

United-Carr Fastener Corp., Cambridge, Mass.; clips, $11,337.

United States Expansion Joint Co., Nashville, Tenn.; steel stakes, $50,438.

Universal Highway Products Co., Chicago; tie bars, $88,179.

Valley Iron Works, Inc., Yakima, Washington; gate frames, $41,990.

Walworth Co., New York; valves, $126,057.

Wheeling Corrugating Co., Philadelphia; cans, $11,340.

Willamette Iron & Steel Corp., Portland, Ore.; gate rollers, $315,326.

Other Machinery

Alliance Machine Co., Alliance, Ohio; crane, $57,500.

American Bosch Corp., Springfield, Mass.; engine parts, $13,175.

Arter Grinding Machine Co., Worcester, Mass.; grinding machines, $18,381.

Barnard Aviation Equipment Co., Inc., Ashley, Pa.; hoists, $59,000.

Bertsch & Co., Inc., Cambridge City, Ind.; roll machine, $17,097.

Brown & Sharpe Mfg. Co., Providence, R. I.; grinding machines, $36,975.

Buda Company, Harvey, Ill.; engine parts, $14,785.

Builders Iron Foundry, Providence, R. I.; lathes, $62,000.

Bullard Co., Bridgeport, Conn.; turret lathe, $12,421.

Busch-Sulzer Bros. Diesel Engine Co., St. Louis; engine parts, $26,517.

Cincinnati Bickford Tool Co., Cincinnati; drills, $26,424.

Cuno Engineering Corp., New York; oil filters, $42,480.

M. T. Davidson Co., Brooklyn, N. Y.; pumps, $20,588.

Detroit Aluminum & Brass Corp., Detroit; bearings, $16,350.

Dorr Company, Inc., New York City; hydroseparators, $21,495.

John Edwards, Inc., Brooklyn, N. Y.; motor parts, $10,953.

Ex-Cell-O-Corp., Detroit; engine parts, $22,216.

Frick Co., Inc., Waynesboro, Pa. refrigeration unit, $13,140.

General Motors Corp., Cleveland Diesel Eng. Div., Cleveland; engine spares, $32,784.

General Tool & Mfg. Co., Irvington, N. J.; draw ties, $28,500.

Given Machinery Co., Los Angeles; lathes, $10,195.

Hardie Tynes Mfg. Co., Birmingham, Ala.; air compressors, $505,542.

Harnischfeger Corp., Milwaukee; excavators, $35,300.

International Harvester Co., Washington; tractors, $13,888.

E. A. Kinsey Co., Cincinnati; grinders, $128,142.

Koehring Co., Milwaukee; dumptors, $20,220.

Landis Tool Co., Waynesboro, Pa.; grinding machines, $10,064.

Leece-Neville Co., Cleveland; engine parts, $11,666.

Lodge & Shipley Mach. Tool Co., Cincinnati; lathes, $14,141.

Marvel-Schebler Carburetor Div., Borg-Warner Corp., Flint, Mich.; controls, $226,237.

Miller Printing Machinery Co., Pittsburgh; gun mounts, $2,306,375.

Mine Safety Appliances Co., Pittsburgh; manifold systems, $67,500.

Monarch Machine Tool Co., Sidney, Ohio; electric lathes, $36,730.

Monarch Machine Tool Co., Sidney, Ohio; engine lathes, $49,883.

Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.; boring machines, $12,626.

Henry Prentiss & Co., Inc., New York; shapers, $28,086.

Henry Prentiss & Co., Inc., New York; boring machine, $25,184.

Pump Engineering Service Corp., Cleveland; test units, $17,860.

Reed-Prentice Corp., Worcester, Mass.; lathes, $62,970.

Rockford Machine Tool Co., Rockford, Ill.; metal shapers, $18,332.

Sebastian Lathe Co., Cincinnati; lathes, $51,064.

Wm. Sellers & Co., Inc., Philadelphia; boring machines, $75,752.

Sharples Corp., Philadelphia; purifiers, $45,052.

Star Machinery Co., Seattle; boring machines, $25,715.

Stewart-Warner Corp., Chicago; engine parts, $11,665.

Stewart-Warner Corp., Chicago; engine parts, $21,786.

Chas. P. Wagner & Bro., New Orleans; bakery equipment, $19,628.

Warner & Swasey Co., Cleveland; lathes, $18,872.

Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.; loading machine, $15,000.

Waukesha Motor Co., Waukesha, Wis.; engine assys., $12,388.

Nonferrous Metals and Alloys

American Brass Co., American Metal Hose **Branch**, Waterbury, Conn.; hose, steam, $67,860.

American Brass Company, Waterbury, Conn.; jacket cups, $209,720.

Atlantic Metal Hose Co., Inc., New York; steam hose, $16,575.

Blackstone Silver Co., Stratford, Conn.; forks, $30,000.

Chase Brass & Copper Co., Inc., Waterbury, Conn.; brass, $48,426.

Hudson Motor Car Co., Detroit; booster parts; $143,824.

International Nickel Co., Inc., New York; alloy rods, bars, $47,681.

National Boston Lead Co., Boston, Mass.; solder, $18,554.

Phelps Dodge Copper Products Corp., New York; brass pipe, $51,364.

Pollak Mfg. Co., Arlington, N. J.; fuse parts, $955,350.

Revere Copper & Brass, Inc., Baltimore Div., Baltimore, Md.; copper tubing, $100,312.

Revere Copper & Brass, Inc., Rome Div., Rome, N. Y.; brass strip, $18,940.

Risdom Manufacturing Co., Naugatuck, Conn.; grommets, $52,000.

Robertshaw Thermostat Co., Youngwood, Pa.; booster parts, $352,100.

Scovill Mfg. Co., Waterbury, Conn.; fuse parts, $720,000.

Scovill Mfg. Co., Waterbury, Conn.; sockets, $27,500.

Stewart-Warner Corp., Chicago; fuse parts, $742,930.

Thorrez & Maes Mfg. Co., Jackson, Michigan; liner assys., $161,250.

United Metal Hose Co., Inc., Long Island City, steam hose, $23,410.

R. Wallace & Sons Mfg. Co., Wallingford, Conn.; spoons, $49,800.

Air Corps

American-LaFrance-Foamite Corp., Elmira, N. Y.; control panel assemblies, $53,298.

Armstrong Bros. Tool Co., Chicago; socket wrenches and parts, $167,485.

Barnard Aviation Equipment Co., Inc., Ashley, Pa.; hoists, $429,400.

Crescent Tool Co., Jamestown, N. Y.; pliers, $27,263.

Douglas Aircraft Co., Inc., Santa Monica, Cal.; maintenance parts, $57,294.

Kennedy Mfg. Co., Van Wert, Ohio; tool kits, $26,639.

E. A. Kinsey Co., Cincinnati; socket wrenches and parts, $3,972.

Minneapolis-Honeywell Regulator Co., Minneapolis; sight assemblies, $244,500.

Plomb Tool Co., Los Angeles; socket wrenches and parts, $81,330.

Trailer Co. of America, Oakley, Cincinnati; trailers, $82,416.

Weston Electrical Instrument Co., Newark, N. J.; ammeter and voltmeter assemblies, $110,728.

Weston Electrical Instrument Co., Newark; indicator and generator tachometers, $363,965.

J. H. Williams & Co., New York; socket wrenches and parts, $11,082.

Wright Tool & Forge Co., (Ohio Corp.) Barberton, Ohio; socket wrenches and parts, $285.

Yale & Towne Mfg. Co., Stamford, Conn.; pumps-fuel, $45,410.

Ordnance Department

American Cyanamid & Chemical Corp., Warners, N. J., artillery ammunition components, $15,134.

American Type Founders Corp., Philadelphia; stitchers, $1,024.

Austin-Hastings Co., Inc., Distributors, Armstrong-Blum Mfg. Co., Chicago; machines, hack saw, $13,781.

Barnard Aviation Equipment Co., Inc., Ashley, Pa.; sight assemblies, $163,864.

Bendix Aviation Corp., Eclipse Aviation Div., Bendix, N. J.; automotive equipment, $271,308.

Blaw-Knox Co., Union Steel Castings Div., Pittsburgh; castings, $2,500.

Bridgeport Brass Co., Bridgeport, Conn.; artillery ammunition components, $229,500.

Brown Instrument Co., Philadelphia; recording and controlling instruments, $2,048.

C. & B. Machine Co., New Haven, Conn.; gages, $1,400.

Canister Co., Phillipsburg, N. J.; artillery ammunition components, $1,093.

Chase Brass & Copper Co., Waterbury, Conn.; brass, $22,367.

Chase Brass & Copper Co., Waterbury, Conn.; small arms ammunition, $95,625.

Clark Equipment Co., Clark Tructractor Div., Battle Creek, Mich.; tractors, $1,110.

Colonial Broach Co., Detroit; broach sections, $3,971.

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.; components for Colt's auto pistol, $1,615.

Comtor Co., Waltham, Mass.; gages, $3,324.

Continental Machines, Inc., Minneapolis; machines, shaping, $4,528.

Crescent Truck Co., Lebanon, Pa.; truck, electric lift, $2,120.

Dow Chemical Co., New York; artillery ammunition components, $37,950.

E. I. du Pont de Nemours & Co., Carney's Point, N. J.; small arms ammunition, $14,870.

E. L. Essley Machinery Co., Chicago; machines, riveting, $1,113.

A. Finkl & Sons Co., Chicago; artillery material, $15,600.

Firth-Sterling Steel Co., Philadelphia; dies, $4,000.

Goodyear Tire & Rubber Co., Akron; band tracks for half track vehicles, $17,500.

Guiberson Diesel Engine Co., Chicago, Ill.; **Breeze Corp., Inc.**, Newark, N. J.; automotive equipment, $195,030.

Hadley Special Tool Co., Inc., Boston; assemblies for machine gun, $2,041.

Halpin Mfg. Co., Inc., Long Island City, N. Y.; gages, $1,193.

Hanson-Van-Winkle-Munning Co., Matawan, N. J.; motor generator, $4,171.

Hanson-Whitney Machine Co., Hartford, Conn.; tap, sub acme, $1,080.

Hardinge Brothers, Inc., Elmira, N. Y.; lathes, $1,426.

Hercules Powder Co., Kenvil Plant, Kenvil, N. J.; artillery ammunition components, $2,820.

Lamson Co., Syracuse, N. Y.; small arms ammunition, $441,000.

E. P. Lawson Co., Inc., Philadelphia; machines, $1,265.

McKinney Mfg. Co., Pittsburgh; artillery ammunition components, $10,997.

Milwaukee Saddlery Co., Milwaukee, accessories for mortars and mounts, $34,388.

Pipe Machinery Co., Cleveland; gages, $2,323.

Poor & Co., Canton Forge & Axle Works, Canton, Ohio; artillery material, $2,649.

Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.; gages, $3,838.

Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.; gages, $18,880.

Precise Tool & Mfg. Co., Farmington, Mich.; gages, $2,399.

Revere Copper & Brass, Inc., Baltimore; small arms ammunition, $8,868.

S. & S. Tool & Mfg. Co., Detroit; artillery material, $1,008.

Scovill Mfg. Co., Waterbury, Conn.; artillery ammunition components, $87,904.

Scovill Mfg. Co., Waterbury, Conn.; small arms ammunition, $96,000.

Size Control Co., Chicago; gages, $1,181.

Stow Mfg. Co., Inc., Binghamton, N. Y.; small arms material, $36,860.

Struthers Wells-Titusville Corp., Titusville, Pa.; artillery material, $238,366.

Taft-Pierce Mfg. Co., Woonsocket, R. I.; gages, $10,535.

Threadwell Tap & Die Co., Greenfield, Mass.; cutters, $2,800.

United Shoe Machinery Corp., Beverly, Mass.; forging dies, $1,212.

Veit & Young, Philadelphia; tools for small arms, $38,176.

Vince Corp., Detroit; gages, $1,887.

Vulcan Mold & Iron Co., Latrobe, Pa.; molds, $25,561.

Western Cartridge Co., East Alton, Ill.; small arms ammunition, $10,286.

Navy Bureau of Supplies and Accounts

Aldrich Pump Co., Allentown, Pa.; pumps, centrifugal type, $5,556.

Allegheny Ludlum Steel Corp., Brakenridge, Pa.; steel, corrosion-resisting, $310,915.

Allis-Chalmers Mfg. Co., Milwaukee; gas turbine test equipment, $182,000.

Aluminum Cooking Utensil Co., New Kensington, Pa.; kettles, steam jacketed, $80,021.

American Brass Co., Waterbury, Conn.; tubing, copper-nickel alloy, $40,441.

American Car & Foundry Co., New York; burster links shear pins, round pin shackles, $10,806.

American Metal Co., Ltd., New York; lead, pig, $104,807.

American Smelting & Refining Co., New York; copper, ingot, $109,060.

American Tool Works Co., Cincinnati; lathes, engine, $19,960.

Anaconda Wire & Cable Co., Washington; cable, electric, $30,085.

Anaconda Wire & Cable Co., New York; cable, electric, $7,277.

Automatic Pencil Sharpener Co., Div. of Spengler-Loomis Mfg. Co., Chicago; sharpeners, pencil, $12,618.

Babcock & Wilcox Co., Beaver Falls, Pa.; tubes, boiler, $7,739.

Bridgeport Brass Co., Bridgeport, Conn.; tubes, brass, $31,507.

Brown & Sharpe Mfg. Co., Providence, R. I.; machines, screw, automatic, $17,232.

Buda Co., Washington; engines, diesel, for power boats, $1,304,988.

Calumet & Hecla Consolidated Copper Co., New York; copper, ingot, $48,200.

Carnegie-Illinois Steel Corp., Washington; steel, corrosion-resisting, $37,415.

Circle Wire & Cable Corp., Maspeth, L. I., N. Y.; cable, electric, $55,209.

Collyer Insulated Wire Co., Pawtucket, R. I.; cable, electric, $27,888.

Collyer Insulated Wire Co., Pawtucket, R. I.; wire, copper, $200,500.

Compressed Steel Shafting Co., Readville, Mass.; steel, cold-rolled, $7,149.

Crescent Insulated Wire & Cable Co., Trenton, N. J.; cable, electric, $27,700.

Crucible Steel Co. of America, New York; electrode, welding steel, $7,899.

Electro Refractories & Alloys Corp., Buffalo, N. Y.; crucibles, without covers, $6,564.

Erie Foundry Co., Erie, Pa.; hammer, drop forge, $9,270.

Federated Metals Div. American Smelting & Refining Co., San Francisco; lead pig, $13,133.

Flemm Lead Co., Inc., Long Island City; lead, sheet, $13,139.

Florence Pipe Foundry & Machine Co., Philadelphia; press, flanging, hydraulic, $19,170.

Flexitallic Gasket Co., Camden, N. J.; gaskets, $5,864.

General Cable Corp., Washington; wire, copper, $304,962.

General Cable Corp., Washington; cable, electric, $171,229.

General Fireproofing Co., Washington; tables, $45,158.

Gillespie-Rogers-Pyatt Co., Inc., New York; gum, damar, batavia, $12,200.

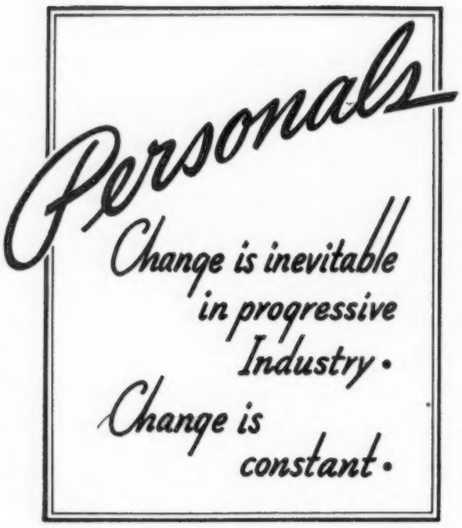
• **C. M. Doiseau,** since early this year vice-president and general manager of the Cincinnati Ball Crank Co., Cincinnati, has been elected president, succeeding **Reamy C. Field,** chairman of the board, who has been acting as temporary president. Mr. Doiseau has held widely diversified executive positions during his business career.

• **Leon F. Payne,** who has been vice-president, treasurer and a director of Oil Well Supply Co., U. S. Steel subsidiary, since 1929, has been elected treasurer of Carnegie-Illinois Steel Corp. He succeeds **Frank C. Harper,** who has retired. Mr. Payne joined the sales department of Carnegie Steel Co. and after a year was transferred to the credit. He was made credit manager of the company in 1918 and continued in that capacity until 1929, when he was made vice-president of the Oil Well Supply Co. Mr. Payne was graduated from Brown University in 1907.

Mr. Harper, who retired on Dec. 16, has been associated with U. S. Steel subsidiaries since 1909, when he became assistant secretary and assistant treasurer of American Sheet & Tin Plate Co. He later became secretary and treasurer and in 1935 was named vice-president and general manager of sales. Upon consolidation of the Sheet & Tin Plate company with Carnegie-Illinois in 1936, Mr. Harper was elected treasurer of the combined corporation.

• **J. H. Marshall,** heretofore identified with the sales department of the composite steel division of Jessop Steel Co., Washington, Pa., has been appointed a sales representative for the company in the Buffalo district, with headquarters at 130 Groveland Avenue, Buffalo. He is a graduate of Marietta College.

• **Bayard D. Kunkle,** vice-president of General Motors Corp. in charge of the accessory group division, has been named vice-president in charge of personnel. At the same time, announcement was made of the transfer of **Floyd O. Tanner,** vice-president in charge of industrial relations, to be vice-president in charge of manufacturing. **W. C. Williams, Jr.,** of the manufacturing staff of the corporation, was made vice-president



in charge of the accessories division. **L. C. Goad,** general manager of the AC Spark Plug Division, was transferred to Detroit as assistant to Mr. Williams. **George Mann, Jr.,** assistant secretary and director of industrial relations for the AC division, was named general manager of the AC Spark Plug Division.

• **H. V. Putman,** since 1931 manager of engineering at the Sharon, Pa., transformer works of Westinghouse Electric & Mfg. Co., has been appointed manager of that division, succeeding **M. L. Fawcett,** who has been transferred to Pittsburgh as staff assistant to the general works manager. Since joining the Westinghouse company in 1925, Mr. Putman's duties have included those of design engineer on synchronous motors, section engineer in charge of motor design and assistant manager of the transformer division engineering department. He is a graduate of Union College.

• **Arthur W. Steudel** has become president of the Sherwin-Williams Co., Cleveland paint manufacturer. He succeeds **George A. Martin,** who becomes chairman of the board. Mr. Steudel since 1929 has been vice-president and in 1937 became vice-president and general manager. He has been with the company since 1905. **E. E. Ware** has been elected vice-president and technical director.

• **John T. Corrodi** has been appointed assistant general manager of the Curtiss-Wright airplane plant at Port Columbus, Ohio, according to an announcement by J. A. Williams, general manager of the plant.

• **P. B. Brown** has been appointed chairman of Hadfields, in succession to Sir Robert Hadfield, and **Maj. A. B. H. Clarke** has been appointed to succeed Mr. Brown as deputy chairman. Mr. Brown is chairman of the Oughtibridge Silica Firebrick Co., and a director of John Baker & Bessemer, Lilleshall Co., and Tinsley Rolling Mills.

• **Robert Stewart Johnson** has been elected chairman of Cammell Laird & Co., shipbuilding and engineering concern, in place of Mr. Hichens. Mr. Johnson will retain the position of managing director.

• **Walter E. Rogers,** formerly Western sales manager of the Taft-Peirce Mfg. Co., Woonsocket, R. I., with headquarters in Indianapolis, has been elected assistant secretary. Starting in 1921 as a salesman in the company's Indianapolis office, and subsequently in the Chicago office, Mr. Rogers left Taft-Peirce in 1923 to accept a position as manager of the small tool department of the Vonnegut Machinery Co. He returned to Taft-Peirce in 1927 and has been with the company continuously since that time.

• **M. C. Pecsok,** who began work with the Osborn Mfg. Co., Cleveland, as an office boy in 1912, has been made sales manager of the brush division. He rose through the ranks and has been the company's sales representative in the northern Ohio territory for the past 16 years.

• **L. L. Lewis,** vice-president in charge of engineering of the Carrier Corp., Syracuse, N. Y., and one of the early pioneers in air conditioning, has been elected president of the American Society of Refrigerating Engineers. Recently he pioneered again in introducing air conditioning into blast furnace operations.

• **B. H. Chamberlain,** formerly of the Detroit office of the Cutler-Hammer Co., Milwaukee, has been transferred to the sales staff of the Los Angeles office of the company. He has been identified with the company since 1935.

• **W. H. Feldmann,** vice-president in charge of sales since 1937, has

been elected general manager of Electric Machinery Mfg. Co., Minneapolis. Mr. Feldmann has been associated with Electric Machinery Mfg. Co. for 18 years, having been in charge of district sales at Cleveland and Chicago before his appointment as general sales manager in 1927. He was elected a director in 1936.

• **M. P. Hofmann** has been made manager of research and sales for the new colloid mill department of C. O. Bartlett & Snow Co., Cleveland. He gained recognition during the World War developing alloys of zirconium and in later years for his colloidal research. In 1936 he developed the Manton-Gaulin two-stage mill. Working in the C. O. Bartlett & Snow laboratory, he has developed and perfected a new mill, using a three-stage principle.

• **Philip Bailis,** of Max Bailis & Sons, Philadelphia, has been elected president of the Philadelphia chapter of the Institute of Scrap Iron and Steel, Inc. **Joseph V. Bantivoglio,** of Camden Iron & Metal Co., Camden, N. J., has been chosen vice-president; Harry Stave, of Stave Brothers, Philadelphia, treasurer; and Marcus J. Margulies, of A. M. Wood & Co., Inc., Philadelphia, secretary.

• **Edward A. Phoenix,** assistant sales promotion manager in charge of industrial products for Johns-Manville Sales Corp., New York, was honored recently by a luncheon at the Hotel Commodore in New York which marked his completion of 25 years of service with the organization.

• **Charles C. Steel,** who has been identified with the steel rerolling business for the past 25 years, has been made research engineer for the Jersey Shore Steel Co., Lock Haven, Pa. He will organize a research department which will design new products, locate new markets and take up any other activities within the line of research.

• **Leonard K. Schwartz,** manager of the aviation department of the Los Angeles Chamber of Commerce, has been appointed public relations director of the Lockheed Aircraft Corp. He was graduated from Stanford University in 1927.

S. M. JENKS, whose appointment as general superintendent of Gary works, Carnegie - Illinois Steel Corp., was announced in these columns last week.

• **John H. Jouett,** of Washington, has been reelected president of the Aeronautical Chamber of Commerce of America.

• **George A. Moore** has joined the staff of Battelle Memorial Institute, Columbus, Ohio, to engage in research on the faults and failures which occur in the commercial production and fabrication of metals.

• **Gardner W. Carr,** former vice-president and general manager of the Glenn L. Martin Co., has been appointed British contract coordinator in charge of the entire administration of British contracts with the Lockheed Aircraft Corp., Burbank, Cal. For the past several months he has been in charge of production control.

• **C. H. Black** has been named vice-president in charge of sales of American Can Co., New York. He has been general manager of sales of general line cans. **G. H. Kellogg,** vice-president in charge of packers can sales, has been made vice-president in charge of the Central district, with headquarters in Chicago, succeeding **K. S. Breckenridge,** who will retire Dec. 31. **J. A. Stewart,** formerly general manager of manufacture, packers cans, has been made vice-president, and **R. C. Taylor,** formerly general manager of manufacture, general line, has also been appointed vice-president. On the Pacific Coast, **A. C. Webb** has been appointed general manager. He has served for the past 22 years as district sales manager, with headquarters in San Francisco. D. A. MacArthur succeeds him as district sales manager on the Pacific Coast.

Mr. Black joined American Can in 1908 and has played a prominent role in the sales organization during his entire business career.

• **Joseph V. Smith,** vice-president of Hubbard & Co., Pittsburgh, has been appointed a director of the Peoples-Pittsburgh Trust Co. He is also a director of the New York Air Brake Co. and vice-president of Beall Brothers Supply Co.

• **W. P. Baerenrodt** has been appointed treasurer and has been placed in charge of purchasing for the A. P. Smith Mfg. Co., East Orange, N. J.

• **Robert L. Glose** has been appointed sales manager of the newly established construction products division of Pittsburgh Steel Co., Pittsburgh. He formerly was manager of welded fabric and construction products sales for Pittsburgh Steel. **Thomas C. Phillips** has been made dealer sales manager of this division. Mr. Phillips, who was formerly associated with Pittsburgh Steel, has for the past six years been with John-Manville Corp. in charge of the sales of the welded wire building, fabric and Steeltex products manufactured by Pittsburgh Steel Co.

The construction products division will have charge of the sales of all of the company's wire fabric construction products which include welded wire reinforcement for roads, streets, driveways, sidewalks, pools and reservoirs; for airport aprons and runways; for concrete pipe, sewers and culverts; for vaults, walls, floors and roofs; and the line of Pittsburgh Steel's wire reinforcement with integral paper backing for plaster, stucco, stone and brick veneer and floors. Included also in the company's construction products are Pittsburgh safety highway guard and cable guard.

• **John Ekern Ott,** with Acme

Steel Co., Chicago, for 18 years, has been appointed manager of the Archer plant, where he will be in charge of production, warehousing, shipping, maintenance and engineering. **W. C. Childress,** formerly in charge of production and engineering at the Archer plant, has resigned.

• **I. W. Rouzer** was reelected president of the Alabama Mining Institute by the institute's board of governors Dec. 10 and **C. F. DeBardeleben,** president of the Alabama Fuel & Iron Co., was elected first vice-president. Directors elected by the membership of the institute include **H. A. Berg,** president of Woodward Iron Co.; **Hugh Morrow,** president of Sloss-Sheffield Steel & Iron Co., and **J. W. Porter,** president of Alabama By-Products Corp.

• **A. R. Engler** will be in charge of a new Southwestern district office handling the sales and service of Kearney & Trecker milling machines and Gisholt turret lathes, automatic lathes and balancing machines. Mr. Engler will be assisted by **Starr Pitzer** and **Ray Dorow.** The territory which includes Texas, Louisiana, Arkansas, Oklahoma and Kansas will be covered from this office, which is located in the West Building, Houston, Tex.

• **Elmer Ghrist,** who has been identified with Jessop Steel Co., Washington, Pa., since 1935, has been appointed metallurgist. He served for two years in the chemical department and for three years in the metallurgical department. He was graduated from Washington and Jefferson College in 1932 and took graduate work in metallurgy at the Carnegie Institute of Technology.

• **Clinton D. St. Clair** has been appointed works manager of the Boston plant of the Hancock Valve Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn. He attended Purdue University and Pennsylvania State College and since then has had 22 years of manhfacturing experience with the B. F. Goodrich Co., Erie City Iron Works and American Machine & Metals, Inc.

• **S. Wells Utley,** president of the Detroit Steel Casting Co., Detroit, will speak on "What Industry Means to Civilization," at the Jan. 8 business session of the annual convention of the Institute of Scrap Iron and Steel, Inc., at Baltimore.

Obituary

• **George P. Rhodes, Jr.,** formerly president of Colonial Steel Co., died in Pittsburgh on Dec. 12 after a long illness. He was 69 years old. He had been identified with the steel industry throughout the greater part of his business career. In 1900 he founded the Pennsylvania Casting & Machine Works with his brother. Five years later they formed the National Car Wheel Co. He had been president of the Castalia Portland Cement Co. since 1923.

• **Frank Contey, Sr.,** head of the company of the same name and who had been identified with the scrap iron and steel industry since 1896, died in Jersey City on Dec. 12, aged 70 years.

• **Christian C. Foerstner,** manager of the Cleveland branch of National Lead Co., of New Jersey, for 31 years until his retirement in 1937, died Dec. 10, aged 69 years.

• **Marshall Williams,** retired assistant to the president, American Bridge Co., Pittsburgh, died at his home recently. Mr. Williams had been connected with the bridge company for 42 years. He was a member of the American Welding Society, American Society of Civil Engineers, and the Engineers' Society of Western Pennsylvania. He was 67 years old.

• **W. Kenneth Eichfeld,** vice-president of the William F. Eichfeld & Sons Co., structural steel firm at Milwaukee, died Dec. 9 in a local hospital. He was a native of Milwaukee and a graduate of the universities of Illinois and Wisconsin and joined his father's firm after having finished his schooling. He was 36 years old.

• **Burton A. Ployd,** Detroit representative of Sharon Steel Corp., died Dec. 8 in Harper Hospital, Detroit. Before going to Detroit 11 years ago, Mr. Ployd was associated with the Newton Steel Co. He was 45 years old.

64 Engineering Schools Add Defense Courses

Washington

• • • **Sixty-four engineering** colleges in 35 states are adding short but intensive training courses to meet the shortage of engineers for service as designers, inspectors and supervisors with private and government agencies engaged in the defense program.

The courses cover a wide range of subjects including industrial practice in the steel industry, structural steel design, metallurgy, strength of materials and steel design, tool and machine design, production engineering and supervision.

After satisfying school authorities that they have the requisite technical training and experience to understand the subject and are employable in defense work, applicants will have their tuition paid by the federal government. Many of the courses will be given after working hours at locations near industrial areas. In many instances key men in defense industries will serve as instructors.

Magnetization Limit Of Iron Determined

Washington

The limit of intrinsic magnetization of which iron is capable has been determined as a result of experiments recently concluded at the National Bureau of Standards, Department of Commerce.

The success of the experiments, it was said, was made possible because there was made available for the first time the ingots of practically pure iron on which the requisite measurements could be made.

The iron was prepared in the Bureau's Division of Metallurgy and analysis by the best available methods showed impurities of not over .01 per cent.

Magnetic measurements were made on several specimens taken from these ingots and every precaution was used to insure high accuracy. The value for magnetic saturation induction of pure iron at 25 deg. Cent. (77 deg. Fahrenheit) is 21.58 kilogauss, with an uncertainty of .01. The gauss is the unit of magnetic induction.

Metal Working Activity

. . . Latest Data Assembled by The Iron Age

From Recognized Sources. In Net Tons.

	Oct. 1940	Sept. 1940	Oct. 1039	10 Months 1940	10 Months 1939
Steel Ingots:					
Monthly output[a]	6,461,898	5,895,232	6,080,177	52,663,361	39,615,189
Average weekly output[a]	1,458,668	1,377,391	1,372,500	1,208,707	912,162
Per cent of capacity[a]	96.10	90.75	89.75	79.64	59.65
Pig Iron:					
Monthly output[b]	4,445,961	4,176,527	4,062,901	37,998,074	26,929,950
Raw Materials:					
Coke output[c]	5,202,764	4,899,201	4,779,100	46,251,334	34,379,800
Lake ore consumed[d]	6,777,509	6,352,548	5,903,192	56,313,901	37,346,340
Scrap iron consumed[r]	4,740,960	4,341,120	4,266,080	37,872,800	27,958,560
Castings:					
Malleable, orders[e]	71,129	53,079	63,835	440,652	391,726
Steel, orders[e]	112,327	83,545	119,687	606,647	521,032
Finished Steel:					
Trackwork shipments[a]					
Fabricated shape orders[f]	233,115	225,494	118,841	1,395,248	1,121,350
Fabricated plate orders[e]	*	*	37,766	*	307,746
U. S. Steel Corp. shipments[g]	1,572,408	1,392,838	1,345,855	12,006,135	8,901,942
Fabricated Products:					
Automobile production[h]	493,223	269,108	313,392	3,498,435	2,773,365
Steel furniture shipments[e]	3,089,852	2,391,691	2,149,691	22,292,569	18,262,910
Steel boiler orders[e] (sq. ft.)	1,707,956	3,726,433	1,089,228	13,948,378	9,742,487
Locomotives ordered[i]	30	57	34	388	247
Freight cars ordered[i]	11,786	9,470	11,220	45,272	44,843
Machine tool index[j]	96.8	94.9	84.9	93.1†	65.6
Foundry equipment index[k]	264.0	161.2	*	169.21†	*
Gear sales index	216	183	141	147†	100.4
Non-Ferrous Metals: (U. S. only)					
Lead shipments[l]	62,496	53,456	66,060	488,878	445,828
Lead stocks[l]	35,386	41,292	73,963	.....	.....
Zinc shipments[m]	64,787	66,824	73,327	567,065	481,097
Zinc stocks[m]	22,600	30,965	72,405	.....	.....
Tin deliveries[n]	13,238	12,779	6,765	104,870	58,979
Refined copper deliveries[o]	103,771	96,485	*	786,732	*
Refined copper stocks[o]	164,618	185,313	*	.....	*
Exports:					
Total iron and steel[p]	1,238,171	1,221,052	662,879	10,097,129	5,454,891
All rolled and finished steel[p]	446,874	402,997	179,318	3,793,784	1,561,595
Semi-finished steel[p]	428,238	462,732	39,761	2,623,541	196,436
Scrap[p]	289,997	255,608	377,188	3,000,210	3,470,173
Imports:					
Total iron and steel[p]	4,442	2,598	21,492	58,530	319,576
Pig iron[p]	661	1,830	5,686	11,361	38,640
All rolled and finished steel[p]	259	451	4,808	14,075	166,839

Source of data: [a] American Iron and Steel Institute; [b] THE IRON AGE; [c] Bureau of Mines; [d] Lake Superior Iron Ore Association; [e] Bureau of the Census; [f] American Institute of Steel Construction; [g] United States Steel Corp.; [h] Preliminary estimates by THE IRON AGE—Final figures from Bureau of the Census, U. S. only; [i] *Railway Age;* [j] National Machine Tool Builders Association; [k] Foundry Equipment Manufacturers Association; [l] American Bureau of Metal Statistics; [m] American Zinc Institute; [n] New York Commodity Exchange; [o] Copper Institute; [p] Department of Commerce; [r] Institute of Scrap Iron and Steel; [s] American Gear Manufacturers Association.

* Not available. † Monthly averages.

The Iron Age Comparison of Prices

Advances Over Past Week in Heavy Type; Declines in Italics

	Dec. 16, 1940	Dec. 10, 1940	Nov. 19, 1940	Dec. 18, 1939
Flat Rolled Steel:				
(Cents Per Lb.)				
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Tin and Terne Plate:				
(Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Manufacturing ternes	4.30	4.30	4.30	4.30
Bars and Shapes:				
(Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Wire and Wire Products:				
(Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails:				
(Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel:				
(Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Wire Rods and Skelp:				
(Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

	Dec. 16, 1940	Dec. 10, 1940	Nov. 19, 1940	Dec. 18, 1939
Pig Iron:				
(Per Gross Ton)				
No. 2 fdy., Philadelphia	$24.84	$24.84	$24.84	$24.84
No. 2, Valley furnace	23.00	23.00	23.00	23.00
No. 2, Southern Cin'ti	23.06	23.06	26.06	23.06
No. 2, Birmingham	19.38	19.38	19.38	19.38
No. 2, foundry, Chicago†	23.00	23.00	23.00	23.00
Basic, del'd eastern Pa.	24.34	24.34	24.34	24.34
Basic, Valley furnace	22.50	22.50	22.50	22.50
Malleable, Chicago†	23.00	23.00	23.00	23.00
Malleable, Valley	23.00	23.00	23.00	23.00
L. S. charcoal, Chicago	30.34	30.34	30.34	30.34
Ferromanganese‡	120.00	120.00	120.00	100.00

†The switching charge for delivery to foundries in the Chicago district is 60c per ton. ‡For carlots at seaboard.

Scrap:				
(Per Gross Ton)				
Heavy melt'g steel, P'gh.	$22.75	$22.75	$21.75	$18.25
Heavy melt'g steel, Phila.	20.75	20.75	20.75	18.75
Heavy melt'g steel, Ch'go	20.50	20.50	20.25	16.50
Carwheels, Chicago	21.75	21.75	21.00	16.00
Carwheels, Philadelphia	23.25	23.25	23.25	20.25
No. 1 cast, Pittsburgh	22.75	22.75	22.25	19.25
No. 1 cast, Philadelphia	23.25	23.25	22.75	20.75
No. 1 cast, Ch'go (net ton)	19.25	19.25	18.00	14.50
Coke, Connellsville:				
(Per Net Ton at Oven)				
Furnace coke, prompt	$5.50	$5.25	$5.25	$5.00
Foundry coke, prompt	5.75	5.75	5.75	5.75
Non-Ferrous Metals:				
(Cents per Lb. to Large Buyers)				
Copper, electro., Conn.*	12.00	12.00	12.00	12.50
Copper, Lake, New York	12.00	12.00	12.00	12.50
Tin (Straits), New York	*50.05*	50.10	50.375	51.00
Zinc, East St. Louis	7.25	7.25	7.25	6.00
Lead, St. Louis	5.35	5.35	5.65	5.35
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

*Mine producers only.

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 107-116 herein.

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Composite Prices

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Dec. 16, 1940	2.261c. a Lb.	$22.61 a Gross Ton	$21.33 a Gross Ton
One week ago	2.261c. a Lb.	$22.61 a Gross Ton	$21.33 a Gross Ton
One month ago	2.261c. a Lb.	$22.61 a Gross Ton	$20.92 a Gross Ton
One year ago	2.261c. a Lb.	$22.61 a Gross Ton	$17.83 a Gross Ton

	High	Low	High	Low	High	Low
1940	2.261c., Jan. 2	2.211c., Apr. 16	.....	.....	$21.33, Dec. 10	$16.04, Apr. 9
1939	2.286c., Jan. 3	2.236c., May 16	$22.61, Sept. 19	$20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.236c., May 28	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Summary of the Week

· Formal priorities for steel expected within a short time . . . Greater aid for Britain is believed to be chief reason as supplies otherwise have been adequate . . . Pig iron sales made at $1 advance . . . Some producers withdraw from market pending decision on prices.

FORMAL government priorities for steel and other essential defense materials and machines, replacing the voluntary system that has been functioning since the defense program was started, may be adopted very shortly, perhaps within a few days. It is understood that an Iron and Steel Priorities Committee is now in process of formation by the National Defense Advisory Commission.

This move, which has been avoided all along, although the machinery has been prepared for it, is apparently intended as one method of giving prompt aid to Great Britain, so far as the steel industry is concerned, since the supply of steel for defense projects and for full civilian consumption has not yet been proved to be inadequate. However, if Great Britain is given the larger tonnages that she is now seeking for delivery during the first quarter, some domestic orders for non-defense work may be subject to still further delivery delays.

In some metals other than steel, zinc, for example, the supply situation has reached a critical stage. The zinc producing industry has for some weeks been allocating supplies to its customers on a rationing basis.

As the national defense program and British requirements promise to absorb an even larger proportion of steel tonnage than they have during this quarter, the question of whether the so-called normal requirements of the country can continue to be supplied with steel in the present satisfactory manner is receiving renewed attention. The idea that accelerated production of consumer goods, complete retention of all social gains, including the 40-hr. week and full protection of union labor's organizational activities, can be had along with a full-speed defense program has been fostered in certain official circles in Washington, but it is now seriously questioned in the light of the present emergency requirements and the necessity of speeding up the defense program and aid to Britain.

PRICES of pig iron and scrap are occupying the attention of the trade this week. The advance of $1 a ton by an important merchant pig iron producer last week has not been generally followed throughout the pig iron trade, but a few other producers are asking the higher prices, while others have temporarily withdrawn from the market pending definite action. Though decisions are being considered hesitatingly, it is believed that within another week all available iron will be quoted at $1 higher. In some districts substantial sales for first-quarter shipment have been made at the new prices.

Rising scrap prices in the past few weeks have resulted in a call from the price stabilization division of the National Defense Advisory Commission to representatives of the scrap trade and the steel mills to attend another series of meetings this week at which prices and the supply situation will both be canvassed. Some elements of the scrap trade are predicting a scrap shortage and contend that only by higher prices can a sufficient supply be brought out to meet the increasing demand. Meanwhile, THE IRON AGE scrap composite price is unchanged this week at $21.33 after five weeks of slow advances which have totaled 66c.

PROJECTED increases in pig iron and coke making capacity have been announced by several companies. National Steel Corp. will increase its pig iron capacity 420,000 tons a year by new construction and rebuilding. Several contracts for by-product coke ovens have recently been let or are about to be, and additional beehive ovens in the Connellsville region are to be rehabilitated and put into service. Connellsville furnace coke is higher, sales having been made up to $5.75 a ton.

Steel operations for the country have snapped back to an average of 97 per cent after a slight dip last week to 96½ per cent. Fluctuations are mainly the result of furnaces going in and out before and after repairs.

The heavy demand for steel products has not subsided in the major selling areas, though in some sections there has been a moderate letdown which may be only temporary.

Fabricated structural steel awards of 35,450 tons are almost double those reported a week ago. New projects call for 30,550 tons. The only sizable railroad purchase was 2500 freight cars by the Northern Pacific.

Huge shipyards to assemble ships for Great Britain will be built, it is reported, on sites near Portland, Ore., and Seattle, Wash., in charge of the Todd Shipyards Corp., New York.

The Industrial Pace . . .

OPERATIONS IN THE DURABLE GOODS INDUSTRIES, as measured by THE IRON AGE INDEX of capital goods activity, rose to a higher level in the past week when the index reversed itself and shifted upward 1.8 points to 126.2, approximating closely the level prevailing three weeks ago. The past week's index compared with 105.6 in the corresponding week of 1939. Gains in three of the components were responsible for the advance.

The lumber carloading series again shifted direction the past week, moving up 5.4 points to 85.3, as against 79.9 in the preceding week, and 78.4 a month ago. Although well above the level of 75.0 in the comparable week of 1939, loading of forest products is substantially below that prevailing in the corresponding week of 1929 when the component was 115.8. Cars loaded in the past week totaled 39,833, compared with 38,521 two weeks ago.

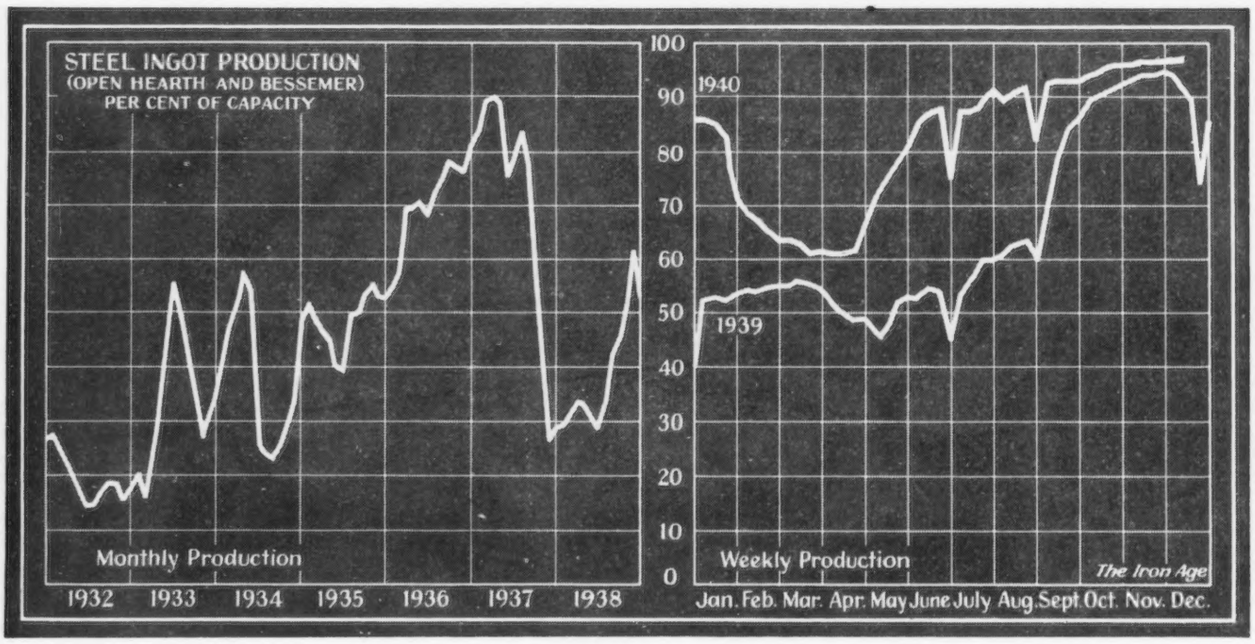
Although automobile producers have passed the point of maximum production for the year, and operations can be expected to follow a general downward trend in the near future, such a movement probably will not be smoothly regular, as evidenced by output in the past week. Production totaled 125,626 cars, compared with 124,790 in the foregoing week. The component was 2.6 points higher, standing at 122.5, against 116.8 a month ago.

THE HEAVY ENGINEERING CONSTRUCTION COMPONENT rose 3.7 points in the week to 157.0, comparing with 122.7 a month ago, and 105.6 in the week ended Dec. 16, 1939. Dollar volume of awards, $81,725,000, was 26 per cent under the previous week, but was 105 per cent higher than the indicated week in 1939. Private construction rose from $19,734,000 to $22,574,000, but public awards dropped to $59,151,000 from $90,769,000.

Shipments of finished steel by subsidiary companies of the U. S. Steel Corp. declined 10 per cent in October, totaling 1,425,352 tons, or 89.6 per cent of capacity, as compared with the 11-year peak total in October of 1,572,408 tons, which equalled 95.8 per cent of capacity. November shipments were approximately 1 per cent higher than those of November, 1939, which totaled 1,406,205 tons. Cumulative shipments in the first 11 months of 1940 were 13,431,487 tons, a 30 per cent increase over the 10,308,147 tons shipped in the corresponding period of 1939.

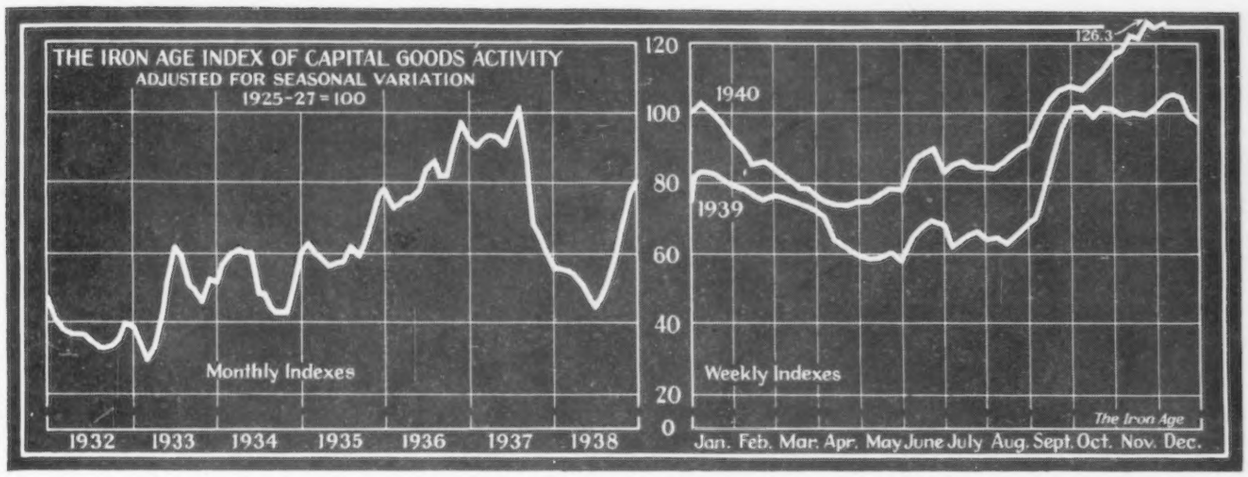
Continuously heavy demand for scrap steel from mills operating at or near capacity levels is having its effect in a creeping upward price movement which has become apparent during the past five weeks. In that period THE IRON AGE scrap composite has risen slowly from $20.67 to $21.33, a rise of 66c., after remaining at the lower level for four consecutive weeks. In the corresponding weeks of 1939 the composite, in the middle of a downward movement, declined $2.55. The present level is $1.17 below the 1939 high of $22.50.

Steel Ingot Rate Again Rises to 97%



District Ingot Production, Per Cent of Capacity		Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	West-ern	St. Louis	East-ern	Aggre-gate
	Current Week ..	96.0	97.5	95.0	94.0	92.0	106.0	104.0	94.0	106.0	100.5	89.0	102.5	115.0	**97.0**
	Previous Week ..	96.0	98.0	95.0	94.0	92.0	104.5	104.0	89.5	106.0	98.0	89.0	102.5	115.0	**96.5**

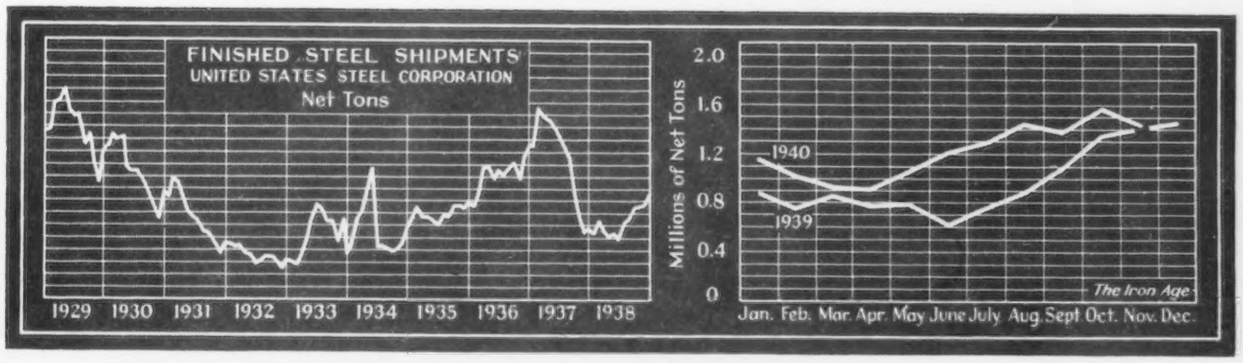
Capital Goods Index Reverses Downturn



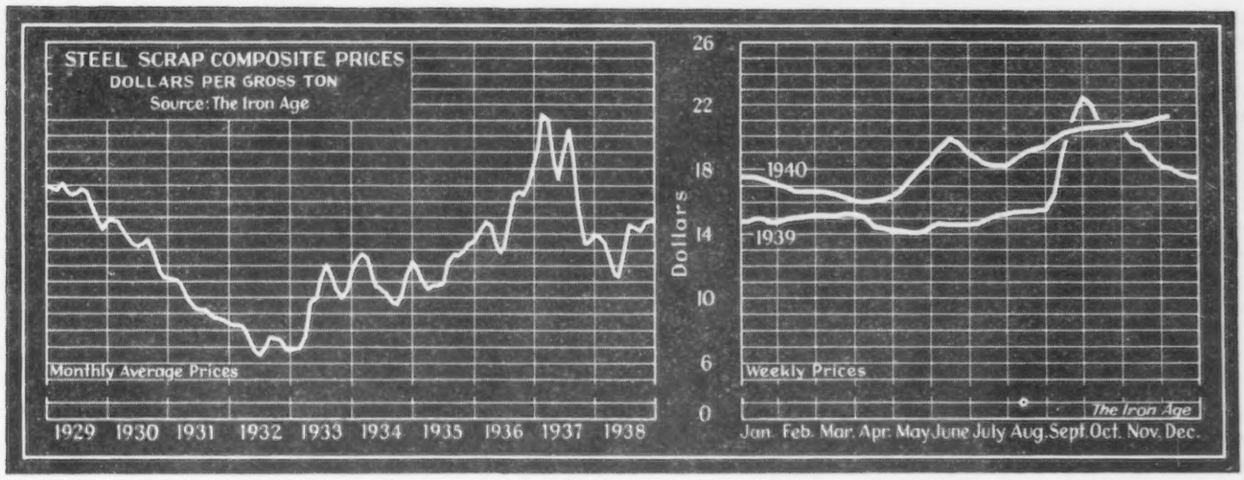
▼ Component Week Ended ➤	Dec. 14	Dec. 7	Nov. 16	Dec. 16 1939	Dec. 14 1929
Steel ingot production[1]	139.5	142.3	143.0	133.5	96.2
Automobile production[2]	122.5	119.9	125.6	116.8	74.4
Construction contracts[3]	157.0	153.3	147.8	82.8	105.3
Forest products carloadings[4]	85.3	79.9	78.4	75.0	115.8
Pittsburgh output and shipments[5]	126.5	126.7	118.9	120.0	104.5
COMBINED INDEX	126.2	124.4	122.7	105.6	99.2

Sources: [1] THE IRON AGE; [2] Wards Automotive Reports; [3] *Engineering News-Record;* [4] Association of American Railroads; [5] University of Pittsburgh. Indexes of forest products carloadings and activity in Pittsburgh area reflect conditions as of week ended Dec. 7. Other indexes cover week of Dec. 14.

U. S. Steel Shipments Off In November



Scrap Prices Rise Slowly In Month



Market News

. . . THE WEEK'S ACTIVITIES IN IRON AND STEEL

New Business

. . . Flow of orders still heavy though checked in some centers

The heavy flow of new business at PITTSBURGH has not subsided. Bookings in the first half of December in the aggregate closely approximate and in some instances are greater than the same period in November when record tonnages were registered. There is little doubt that some of this business is speculative despite stringent measures and efforts on the part of steel companies to keep this type of orders at a minimum. Incoming specifications are still well ahead of ingot output and finished steel shipments.

Sales and inquiries in the CLEVELAND and YOUNGSTOWN steel markets through Dec. 14 were very heavy and decidedly above expectations. About 10 days ago the order backlog of one of the principal CLEVELAND producers edged ahead of the company's previous all-time peak.

Shipments this month will be comparable to those of November, according to all present indications. The usual disinterest among consumers over the year-end holidays is expected to be negligible this year. Production schedules of diversified manufacturers in the CLEVELAND area call for a very high rate of activity at the start of 1941.

Here and there in the CLEVELAND area some of the smaller manufacturers have encountered difficulty obtaining castings or forgings as their regular sources of supply are tied up indefinitely upon government work, but the situation cannot be called widespread by any means.

Mixed trends are reported by leading mills at CHICAGO in the matter of new business. Two producers chalked up substantial gains for the week as against the preceding seven days, but one mill fell off close to 30 per cent. However, all CHICAGO sellers find December substantially ahead of the same period in November, ranging all the way from 10 to 30 per cent—and this despite the fact that the early part of November was close to record breaking.

Fresh orders are coming well ahead of shipments and backlogs are building up steadily. By the end of the month, producers expected to see their first quarter books filled up almost solidly. The tin plate outlook in CHICAGO is definitely brighter with orders starting a stream that bids fair to gain in strength. Automotive buyers have not diminished purchases and the decline is expected to be gradual, as opposed to the usual slump.

Household appliance manufacturers are especially active and farm implement builders are not only doing a thriving business in their regular lines but are looking to the handling of considerable defense business. Jobbers' inventories in that district are estimated to average about 90 days, while the stocks of manufacturers figure at 60 to 75 days.

Incoming volume of orders at EASTERN PENNSYLVANIA mills remains at or very near the level of November. Extension of deliveries goes on and in those products where they have been pushed back farthest, notably plates, mills able to offer quickest shipments are booking an increased proportion of the tonnage. The heavy influx of sheet business recently has forced deliveries at one mill back to early April. Shipments of certain sizes of structural shapes are up to 16 weeks in one case. Bar deliveries are lengthening as heavy demand continues.

Orders continue to exceed shipments at BIRMINGHAM with resultant extension in deliveries for most products. With 1940 certain to break all production figures in that district, bookings for the first quarter of 1941 assure a high rate in operations. Orders resulting from shipbuilding, railroad car building and plant expansions are being received in a constant and heavy flow.

For the first time in three months, BUFFALO producers report a slight slackening in the flood of new orders received there week after week. With deliveries from three to 20 weeks for the various products, pressure has dropped off considerably. However, mill schedules indicate capacity operation in this district for at least the first four months of 1941. Structural steel still is the leading item on the order books, with sheets, plates and bars close behind.

With consumers fairly well covered for the first two months of 1941 and the mills disinclined to take orders for further extended deliveries, new business in ST. LOUIS has eased off.

Steel Operations

. . . Rate snaps back to 97 per cent after slight dip last week

Ingot output snapped back to 97 per cent of the country's capacity this week after a dip to 96½ per cent last week. While there was a decline of half a point in the Chicago district, most producing areas are holding at previous rates or have gained. Detroit is up four and a half points, the Southern Ohio district is up two and a half points and the Buffalo district has gained one and a half points. Fluctuations in operations are mainly brought about by the shutting down of open hearth furnaces for repairs and their resumption after repairs have been made.

Prices

. . . Pig iron is the main subject of interest

The pig iron situation is the main subject of interest at the moment with respect to prices. This is discussed in detail under the pig iron heading.

Pig Iron

. . . A number of furnaces have withdrawn from market temporarily

Pending definite action in the matter of prices, a number of sellers of merchant pig iron have temporarily withdrawn from the market. The situation varies consider-

ably with each individual producer. Some have good-sized order books taken at the prices that have been in effect, while others have sold no iron for delivery into the first quarter.

While action on prices is being taken with a good deal of hesitation, it appears fairly certain that before the week is out many producers will be quoting on a $1 a ton higher basis even though they may make no formal announcement.

However, until such time as the policy of all producers has been made known the $1 a ton advance can be applied to published quotations of THE IRON AGE only in those districts that have thus far been definitely affected.

Sales at the higher prices have been heavy at CLEVELAND during the past week. At CHICAGO and other points in that area, including ST. LOUIS, orders have also been booked at the higher prices. It is expected that furnaces in the EASTERN PENNSYLVANIA district will quote the higher prices.

The leading steel interest at PITTSBURGH, although having no formal comment on its pig iron prices, is known to have made no change, for the time being at least, in its quotations for any business being accepted for delivery now or during the first quarter. Such business being accepted, however, is believed to be from regular customers. The local merchant furnace at PITTSBURGH has made no move as yet toward announcing what price its consumers will pay for iron delivered in the first quarter.

At YOUNGSTOWN the blast furnace which Youngstown Sheet & Tube Co. has been rebuilding and enlarging went into blast this week, making Valley iron output at the highest rate in many years, with all but two stacks active. A furnace being rebuilt at Ohio Works of Carnegie-Illinois Steel Corp. is expected to be ready to operate in about a week.

Semi-Finished Steel

. . . Orders and production continue at a peak

Semi-finished steel bookings have been swelled somewhat in the past few weeks by British specifications. Placements are ahead of a month ago at this time. Sheet bars, billets, and skelp continue to move briskly at PITTSBURGH. A Japanese inquiry for an additional 15,000 tons of ingots and semi-finished steel has not turned into a firm contract and will undoubtedly be affected by recent government licensing provisions.

Aside from foreign demand, domestic consumers of semi-finished steel are taking most important tonnage from CHICAGO steel makers. Among last week's orders at one mill more than 15,000 tons of billets and slabs were taken by two consumers. A manufacturer of artillery ammunition components took 800 tons for shell forgings. A major percentage of the semi-finished steel demand at CHICAGO is now coming from holders of defense contracts.

Production at CLEVELAND and YOUNGSTOWN continues very high. Only limited amounts of rerolling material can be spared. Sales of forging billets are still being made, but mostly to regular customers. One or two small users of forgings at CLEVELAND have been forced to seek new sources of supply recently.

Tubular Goods

. . . Standard pipe the most active tubular line

Standard pipe is the most active tubular product. Total sales of this item so far this month are running substantially ahead of a month ago. National defense projects are drawing heavily on merchant tubes but a good share of business is also emanating from general building activity. Resale prices are firmer than at any time since 1937. Oil country goods specifications are holding their own against a month ago and in some instances are slightly improved in volume. Deliveries on certain sizes of cold rolled mechanical tubing are running from 12 to 14 weeks and boiler tubes are also in good demand.

Buyers continued this week to send orders for pipe flowing into CHICAGO steel mills in the wake of special pipe discount removals. Pipe lines apparently are being laid increasingly by both oil interests and in public projects for one mill has received considerable tonnage from these sources over the past few weeks. Much purchasing now is in an effort to cover because of the discontinuance of special discounts.

Continued strong demand for standard pipe features the tubular goods markets at CLEVELAND and YOUNGSTOWN. A British interest has been inquiring for a fair sized monthly tonnage of raw material for a new electric weld tube mill which will go into service later in England.

Wire Products

. . . Sales in good volume, especially rods and wire

All types of wire and wire products are reported active at PITTSBURGH with bookings so far this month running from even with to 20 per cent ahead of a month ago. Wire rods are in good demand, manufacturers' wire is moving briskly, and merchant wire products are reaching expected volume. Prices are firm and export business is at fair level.

At CLEVELAND and YOUNGSTOWN no slackening has appeared in manufacturers' wire sales recently and producers haven't been able to trim down their order backlogs in certain items. One seller reports holding an exceptionally large volume of business in cold heading wire in SAE 1035 grade.

In the CHICAGO district, jobbers' stocks are felt to be sufficient to meet a steady demand. Most jobbers are buying at a regular pace to keep up inventories which experience a steady drain.

Sheets and Strip

. . . Deliveries becoming further extended as orders expand

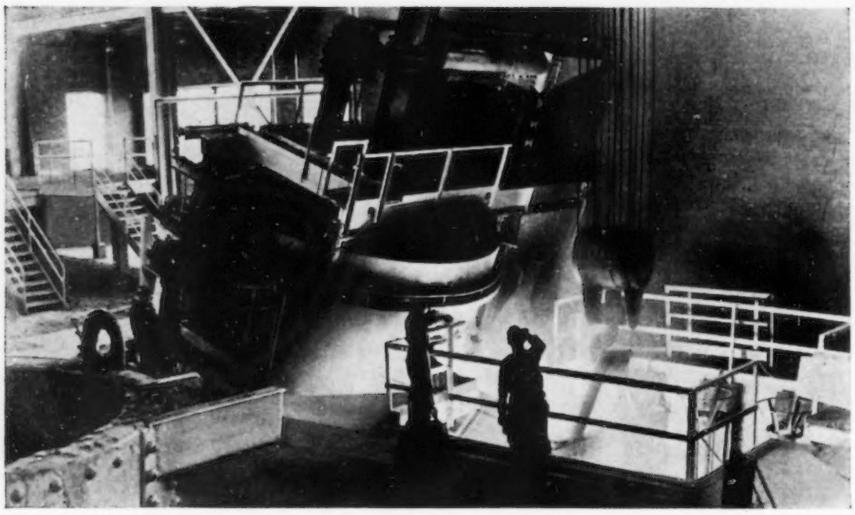
Sheet deliveries at PITTSBURGH have become further extended, business so far this month is moderately ahead of a month ago, and all consumer sources are specifying freely. Export demand, especially from the British, has improved in volume and domestic consumers are still getting on order books as a hedge against the possibility of more extended deliveries early next year.

New tonnage through Dec. 14 at CLEVELAND and YOUNGSTOWN was reported well ahead of the corresponding November period and some mill schedules have been jumping backward at a fast rate. stainless, hot and cold rolled sheets and all other principal items have

been the subject of heavy inquiry. Furthermore, pressure for delivery is increasing. It is understood some consumers are genuinely disturbed over their inventory prospects for January. A large tonnage of cargo body sheets for the Army was placed in the CLEVELAND area recently.

Largest sheet order of the week for a CHICAGO producer came from a manufacturer of refrigerators and stoves, amounting to more than 3000 tons. Cold drawn fabricators, automotive and widely scattered consumers ordered strongly. One mill received a call for over 500 tons to be used in metal furniture. Deliveries on galvanized, hot and cold rolled sheets, which extended sharply in the previous week, were scaled down slightly in the last seven days. Strip mill sizes are promised by one source in four to six weeks, and sizes 2½ in. and under spread out to six to eight weeks.

In SOUTHERN OHIO buying is still reported at about 150 per cent of capacity, with the demand well spread over all sources. No letup in automotive specifications is yet visible, while the household equipment manufacturers continue to be in the market steadily. Defense needs show a steady up trend. Galvanized demand, unseasonably high, is causing serious problems in meeting delivery dates. Mill backlogs run well into February and some into March.



SWINDELL

SWINGING ROOF FURNACES

Produce Top Quality Steel at Lower Cost!

The photograph shows one of a pair of 16′0″ Swindell swinging-roof electric arc melting furnaces, each 35-ton capacity, at the Copperweld Steel Co., Warren, Ohio.

SWINDELL-DRESSLER CORPORATION
PITTSBURGH, PA.

Bolts, Nuts and Rivets

. . . Discounts on stove bolts and galvanized items revised

Early December demand at CLEVELAND has been exceptionally good for practically all items and especially so for the high quality product required by the aircraft industry. Discounts on stove bolts and several galvanized items have been revised.

Structural Steel

. . . Lettings of 35,450 tons and new projects of 30,550 tons

Fabricated structural steel awards of 35,450 tons are almost double those of a week ago. Outstanding lettings are 10,000 tons for the superstructure of a plant addition for the Consolidated Aircraft Corp., San Diego, Cal.; 8000 tons for transmission line towers between Grand Coulee Dam and Covington, Wash.; 5400 tons in Brooklyn for sections of the elevated parkway; 1700 tons for a hydraulic director building for the General Electric Co. at Schenectady, N. Y.; 1300 tons at the Mare Island Navy Yard for an electric plant, steam test plant and sub-assembly facilities; 1200 tons at Detroit for a factory for the Briggs Mfg. Co., and 1000 tons at Deer Park, Long Island, for reception buildings.

New structural projects dropped to 30,550 tons from 72,610 tons last week. The largest inquiries reported include 5675 tons for a hotel in Washington; 4000 tons for

three government warehouses at Columbus, Ohio; 1850 tons for a machine shop for the Midvale Co., Philadelphia; 1500 tons for aviation storage buildings at the Naval Supply Depot, Oakland, Cal., and 1000 tons for a high school auditorium at Berkeley, Cal.

Plates

. . . Mills have heavy rolling schedules ahead

Railroad shops, shipbuilders and miscellaneous manufacturers are still specifying freely on plates at PITTSBURGH and, while some fresh orders have been turned down because of extended deliveries, bookings so far this month are on a par with or exceed the volume placed in the same period last month.

Incoming plate business at CHICAGO last week fell under the previous week's level, though specifications continue to be diversified. A manufacturer of water tanks ordered about 1500 tons. Makers of water boilers as well as farm implement producers came in with sizable orders. A CHICAGO mill extended deliveries on sheared plates, 30 in. to 84 in., up to four to five weeks, and promises on universal plates were lengthened to five to six weeks.

Mills at CLEVELAND and YOUNGSTOWN producing wide plates continue to face heavy schedules. Sales to Great Lakes shipyards making Scotch marine boilers have been very brisk.

Inquiries are out in the EASTERN PENNSYLVANIA district for about 7500 tons of material to be used for the construction of two marine transports and one C2 type cargo vessel.

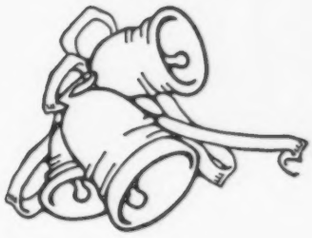
Merchant Bars

. . . No letdown in strong, diversified demand

The upward surge in fresh bar business continued unabated at PITTSBURGH last week. Orders so far this month are running from 6 to 8 per cent ahead of a month ago, which period incidentally was among the most active in bar sales experiences. Demand remains diversified with support from national defense projects increasing.

Bars and small shapes were in very brisk demand at CLEVELAND and YOUNGSTOWN during the first half of December and orders were diversified. Some sellers offer early March as the best delivery promise obtainable. A few mills are unable to run 100 per cent because of difficulty in obtaining semi-finished steel.

An order for nearly 3000 tons came to CHICAGO this week from a manufacturer of fence posts. Automotive and defense orders provided the bulk of the demand for bar items. Around 1000 tons were ordered by an implement manufacturer. Concrete bars are now being sold there almost entirely for defense projects. Deliveries in carbon bars were extended by one producer to eight to 13 weeks, though it is said most sizes are available in from 10 to 13 weeks.



IN this holiday season we reserve our advertising space for a note of thanks to our many friends in the trade and to wish for them a Merry Christmas and Prosperous New Year

STEARNS-MAGNETIC
MILWAUKEE

Railroad Buying

. . . Northern Pacific orders 2500 freight cars

Northern Pacific Railway Co. has ordered 2500 freight cars at an approximate cost of $7,000,000. Of these, American Car & Foundry Co. will build 1000 box and 200 ballast cars at its St. Louis plant and 300 coal cars at Huntington, W. Va. Pullman-Standard Car Mfg. Co. will build 900 box cars at Michigan City and 100 cars at Laurel, Mont. This order makes a total of 4500 cars ordered by the road in the last year at a cost of more than $12,500,000.

Phelps-Dodge Corp. ordered nine electric freight locomotives from Baldwin Locomotive Works, which received two other orders: one small diesel-electric switcher from Santa Fe and two large freight locomotives from Boston & Maine. General Electric had two small orders totaling three diesel-electric switchers. Gulf, Mobile & Ohio has bought four similar units from American Locomotive Co. St. Louis-San Francisco has on order with company shops three 4-8-4 passenger locomotives for delivery in March, five 4-8-2 freight engines for June and 500 40-ton all-steel box cars. Further freight car orders are small in size. Aliquippa & Southern ordered 25 90-ton all-steel gondolas from company shops.

PARISH STAMPINGS Travel Light

CARLINE BRACKET — Used for connection between side posts and roof carlines in body frame construction of present type trailers.

Buses, trailers, railroad cars, and all transportation units, earn dividends through light weight construction. This is made possible by using high strength, corrosion resistance stampings.

To witness:—These brackets made by Parish are of .050" Ga. and 3/16" High Tensile Steel. They bring sturdy endurance, increased pay-load capacity to trailers.

Parish engineers can bring an added value to your product. Let us show you how.

PARISH Specialists in STAMPINGS of Distinction

PARISH PRESSED STEEL CO.
READING, PENNA.
Pacific Coast Representative
F. Somers Peterson Co.,
57 California St.,
San Francisco, California

SPRING BRACKET — For trailer, made of several pressed steel plates welded to form the assembly shown. Lighter and Stronger.

Reinforcing Steel

. . . Awards 6110 tons and new projects 7265 tons

Reinforcing steel awards of 6110 tons include 1100 tons in Queens, N. Y., for sewers, and 1100 tons at Lawrenceburg, Ind., for a warehouse for the Belvedere Corp.

New reinforcing steel projects call for 7265 tons.

Coke

. . . Beehive furnace grade has been sold at $5.75.

Beehive furnace coke demand continues strong and at least one interest has recently paid $5.75 a ton for substantial tonnages. Additional ovens are being put in shape in the Connellsville region with plans under way to bring in even some of the old type rectangular ovens as soon as arrangements have been made to obtain coking coal. Beehive furnace coke is quoted this week at $5.25 to $5.75 a ton f.o.b. Connellsville.

Tin Plate

. . . Chicago sees signs of better buying

Total tin plate operations are estimated this week at 48 per cent, down one point from a week ago, while cold reduction mills are running from 73 to 75 per cent.

Canada's War Orders Reach $800 Millions

Toronto

• • • **With government purchases** topping all previous records, new business is pouring into the primary steel producers in this country at a rate never before equaled. November war orders placed through the Department of Munitions and Supply totaled $131,528,900, bringing awards for the year to more than $800,000,000 for British and Canadian account. Upward of $500,000,000 has been earmarked covering expenditure to March 31, 1941. Canadian industry is operating close to peak capacity on war and ordinary business. To provide greater facilities large plant additions and new factories are under construction in many parts of the Dominion, chiefly for the production of war materials of which iron and steel are the principal components.

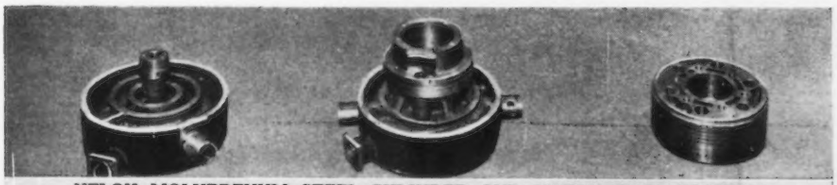
While Canadian steel mills are operating almost to capacity with present equipment, which due to additions and improvements this year is up about 40 per cent over 1939, output falls far short of taking care of demand, and imports of steel from the United States average close to 120,000 tons monthly. Further large tonnage buying is indicated by the big contracts for ordnance, armament, ships, aircraft, etc.

New orders for steel of a widely diversified nature are pouring into the mills in ever increasing volume and booking on some materials have been carried to the end of first half next year. Practically no steel is available for immediate delivery. Prices generally are unchanged and it is understood that the government is exercising some control in this matter. Sheets have been strongly featured on sales sheets recently and local steel interests state that orders are being taken for delivery next June. Merchant bars also in heavy demand, are available on heavy sizes for delivery in March and April, while lighter sizes can be delivered in May and June. In addition to heavy demand for bars from building trades, sales are increasing steadily to tool makers, the automotive industry and other consumers.

Wire and wire products show sharp improvement in demand.

Supply of foundry, malleable and basic pig iron for the merchant trades is causing some concern and melters are worrying about supplies for the coming year. While a few of the larger melters are carrying sufficient iron in stock to take them into the early part of the new year, most of the smaller users are working on hand-to-mouth deliveries. Blast furnace operators are not permitting large tonnage deliveries to build up inventories, but are handing out supplies for current needs only, with the result that shipments mostly are under 200 tons. The Steel Co. of Canada, Ltd., Hamilton, has withdrawn from the market and is using all its pig iron in its steel making operations.

To facilitate production of iron, steel and other materials, the Steel Co. of Canada, Ltd., Hamilton, will start work immediately on plant additions and improvements estimated to cost about $5,000,000.



NELOY-MOLYBDENUM STEEL CYLINDER AND PISTON HEAD CASTINGS

VERSATILITY
in Rough Castings
Another reason leading industrialists specify National-Erie Corporation to fill rush orders for industrial steel castings is the versatility of the National-Erie production setup . . . For instance, special orders, large or small, for steel-mill equipment castings, castings for overhead cranes, for power shovels and power presses . . . National-Erie's electric steel foundries are equipped with furnaces for elasticity in production schedules . . . without disturbing the constant flow of heavy production in the open hearth foundries . . . and Neloy steel castings for special applications . . . rough, finished, heat treated, or flame hardened . . . are produced as specified within the walls of the National-Erie Corporation plant under one unified control and one responsibility.
Send for your copy of Bulletin No. 5. Your orders, large or small, will be filled promptly.
NATIONAL-ERIE
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ERIE, PA., U.S.A.

Machine Tools

. . . SALES, INQUIRIES AND MARKET NEWS

Drift Toward Formal Priorities

New York

• • • **With virtually all** machine tool business being transacted with defense contractors and the problem of deliveries becoming more acute, some dealers here see a rapid drift toward the setting up of formal priorities on machine tool shipments in place of the informal prevailing arrangements. The fact that two men prominent in the machine tool industry have recently joined the priorities committee of the National Defense Advisory Commission lends credence to this view. Deliveries are being quoted well into the latter half of 1941 and occasionally into 1942.

New business is not coming in at the terrific pace of October, but is well above normal. Dealers estimate that the 1940 volume will be six or seven times that of an average year. Inquiries are heavy, but are often vague. Many manufacturers who are in line for government contracts still do not even know what their general requirements for productive machinery will be.

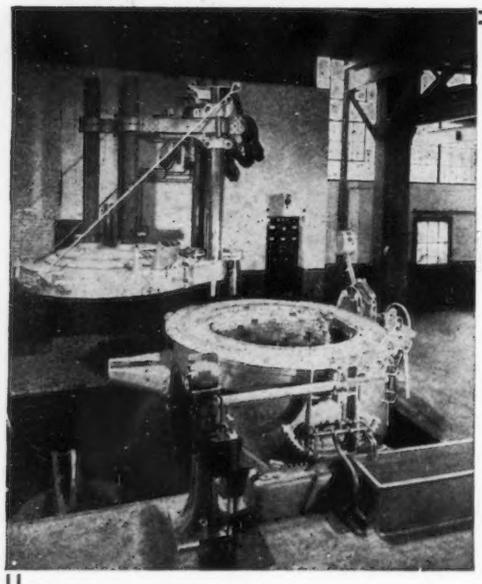
Inquiries Take New Spurt

Cleveland

• • • **The machine tool** market has become more brisk in this vicinity during the past week. Propositions include another inquiry from Cleveland Pneumatic Tool Co., aircraft parts maker, for some $500,000 additional equipment; inquiries from Lima Locomotive Co. in connection with its new tank plant; an inquiry from Hudson Motor Co. aggregating close to 400 machines and considerable business from Ford and Packard. At Toledo, Willys-Overland and Spicer have been buying.

Order backlogs held by principal producers have not been diminished to any appreciable extent. An Ohio lathe company is reported to have for shipment after Jan. 1 orders equivalent to total 1940 billings.

Astoundingly high prices for used equipment have come to light recently. At the liquidation of the Miller Improved Gas Engine Co. in Dayton, Ohio, Dec. 11, a No. 32 Lucas horizontal boring mill, 24-26 years old, brought around $24,000; an old 3-in. bar Lucas and Espen machine which was sold secondhand 20 years ago for $300, brought $7000 at the sale; one No. 0 Giddings & Lewis horizontal boring mill sold for 10,500 and another for $11,600. A 54-in. vertical boring mill around 20 years old went for $10,100.



USE
MOORE RAPID
Lectromelt
FURNACES
for
MELTING
REFINING
SMELTING

Illustration shows top charge type LECTROMELT furnace with roof raised and rotated to one side to permit quick charging with drop bottom bucket.

LECTROMELT furnaces offer the rapid and economic means for the production of plain carbon and alloy steel ingots and castings as well as gray and malleable irons. Top charge and door charge types are both available. LECTROMELT furnaces are built in standard capacities from 25 pounds to 100 tons. Write for details.

PITTSBURGH LECTROMELT FURNACE CORP.
Foot 32nd St. **Pittsburgh, Pa.**

Bookings Through 1941

Cincinnati

• • • **Brisk business** continues in the machine tool market here. Virtually all plants in this area are booked through 1941 with only a small amount of space here and there for additional production. Although labor and material problems continue to be important factors in restricting production, plant expansions are still being considered to accommodate government requests for expansion of output during 1941 which has been set at approximately 50 per cent over present rates.

Tool Makers Get Federal Aid

Chicago

• • • **Although new orders** tapered off slightly during the past few weeks, the machine tool situation in this section is such that a decline in new business is welcome as a relief. Machine tool builders continue expansion programs, some with and some without government aid.W. F. & John Barnes Co., Rockford, Ill., will occupy its new addition within a few months. A sizable government-supported addition to the plant of Danly Machine Specialties, Inc., Chicago, will be ready for production by June 1.

Non-Ferrous Metals

. . . MARKET ACTIVITIES AND PRICE TRENDS

A good volume of activity was reported in all major non-ferrous markets in the past week, including tin, interest in which picked up considerably over that of recent weeks. Consumers' demands in the copper and zinc markets continued to be curtailed by limited supplies, as producers apportioned metal in relation to real requirements. In the lead market buying was rather irregular with ample material available to meet demand.

Domestic stocks of refined copper declined 6200 tons in November to 158,418 tons, the fourth successive monthly decrease, and the lowest stock position since the end of February, monthly statistics showed. Due probably to the shorter month, deliveries to customers were down 1288 tons to 102,483 tons, as compared with 103,771 tons in October. Production in November increased 13,207 tons to 96,283 tons, the highest monthly output shown by statistics.

On the basis of supply restrictions a sizable tonnage of electrolytic copper was sold into consumption in the past week on the basis of 12c. a lb., delivered Connecticut Valley. Prices in the custom smelter market firmed slightly to 12.50c. for the first quarter, and 12,375 for second quarter delivery. The export market was quieter at 10.25c. f.a.s., limited activity being reported.

Zinc

Although the tonnage that buyers would be willing to take off the market at this time continues, as usual, to exceed by far the actual quantity of metal available for sale, there has been, of necessity, a shaving down of the tonnages inquired for. Buyers are now well aware of the fact that they must coordinate their demands with actual requirements in the light of strictly limited supplies. In line with this policy a government inquiry made during the week was reduced 50 per cent from its original estimate. In this situation moderate activity took place in the past week and sales were generally estimated to be in the neighborhood of the previous week's volume. Prime Western continues very firm at 7.64c. a lb., delivered New York.

Lead

Rather spotty buying characterized the market in the past week. Sales were generally in somewhat heavier volume than in the preceding week, but varied in different quarters. Some producers sold at or slightly better than their rate of intake, while others could have satisfied additional inquiry. Whether buyers are waiting for further price reductions before coming into the markets in their recent large numbers cannot be determined but, for the present, the market remains active and firm at 5.50c. a lb., delivered New York.

At current prices offerings of foreign metal are in reduced volume, although an advance would bring out additional quantities.

Tin

Following the announcement of tin plate prices for first quarter a good volume of business was done by producers in the past week with independent consumers at the government buying level. The price of prompt Straits metal slipped to 50.05c. a lb., delivered New York, early in the week and remained there through the period, opening the present week at that level, when transactions began to taper off somewhat. The International Tin Committee will meet in London today to consider the question of quotas subsequent to 1941.

(Non ferrous prices on page 111)

A Bolt Plus-
Any old piece of metal with a head on one end and a threaded shank can be termed a bolt. In buying
CLARK BOLTS AND NUTS
you obtain the Plus—that built-in dependability, accuracy and satisfaction which differentiates between economy and expense.
Send for our complete catalog.
CLARK BROS BOLT CO.
MILLDALE, CONN.

Scrap . . . MARKET ACTIVITIES AND QUOTATION TRENDS

Another series of meetings is being held in Washington this week at the call of the Price Stabilization Division of the National Defense Advisory Commission at which scrap dealers and representatives of the steel mills will discuss the situation. The question of supply is on the program along with that of prices, which have been rising in recent weeks. It is understood that some members of the scrap trade believe that an actual—not an artificial—shortage of scrap is in prospect, while other dealers disagree with this view, the difference in opinion being accounted for, perhaps, by varying conditions geographically.

While many members of the scrap trade assert that they have diligently tried to hold prices down in line with the wishes of the National Defense Commission, they have been foiled in their efforts, they say, by conditions beyond their control, the principal one being the inexorable law of supply and demand. Unless the entire defense program is put on an emergency basis, with rigid controls exercised, which would probably mean a ceiling on scrap prices, this element of the trade sees little chance of preventing scrap prices from going higher.

This week, however, the No. 1 heavy melting grade is unchanged at Pittsburgh, Chicago and Philadelphia; hence THE IRON AGE composite price remains at last week's level of $21.33 after advancing for five weeks. In some other districts many grades have moved up again. Cast grades are particularly strong, possibly influenced to some extent by higher pig iron prices.

Pittsburgh

The market continues exceptionally strong here with No. 1 heavy melting quotably unchanged this week at $22.50 to $23 a ton. Nearby areas are paying more for scrap than is reflected in this district's quotations. Some brokers are still finding it necessary to fill old orders in part at least from yard supplies.

Philadelphia

The yardmen's strike within the city was settled last Friday and shipments to consumers were immediately resumed. Because of its short duration it had little effect on local mills and foundries, which had sufficient reserves to carry them over the week. Steel making grades remained unchanged, although the cast market was stronger. Mixed yard cast went to $20 to $20.50, and stove plate was up 50c. to $18.50 to $19. No. 1 blast furnace rose to $14 flat. Machine shop turnings increased 50c. to $15 to $15.50, while No. 1 low phos. heavy went to $26 to $26.50.

Chicago

With an exceptionally strong market, quotations on No. 1 heavy melting steel are at a flat $20.75. This condition exists despite the fact that many brokers are paying this figure, and in the face of broker-dealer transactions at $21 and unconfirmed mill purchases at $21. Principal buyers, however, have not gone above $20.75. The market situation is increasingly tight with demand very strong and obtaining of material getting more difficult.

Youngstown

The market remains very strong here but without change at the start of this week. Open hearth operations remain at a high peak and scrap shipments are well sustained.

Cleveland

One mill has been in the market recently for small amounts of No. 1 heavy melting but quoted prices appear to be in line with actualities this week. According to custom, collection of railroad scrap will slacken about Dec. 20 and remain light until February. This will affect not only January shipments but those of December as well.

Buffalo

The market in this area continues to increase in strength with sales of No. 1 heavy melting steel reported in the range of $22 to $22.50, up 50c. from last week. Low phos. is up $1 and every other item in the Buffalo list has advanced 50c. this week on the basis of price ranges reported on a tremendous volume of undercover business. There is no indication of scrap shortage in this area.

St. Louis

Covering of short interests by dealers caused an advance of 50c. a ton on No. 2 heavy melting steel, and a few other items on the list. Recent advances, however, have not been accepted by mills in the St. Louis industrial district.

Cincinnati

All types of old materials are definitely active, although dealers indicate heavier pressure for the better steel grades. Prices are all up. The trade generally indicates that there is still room for improvement in the amount of scrap coming into the market. Shipments on contract continue active with users taking virtually all material offered.

Birmingham

The scrap market here continues strong with demand preventing accumulation in dealers' yards. This demand more than offsets a slightly larger increase in the movement of agricultural scrap. For the first time in several weeks prices are unchanged.

Detroit

The Detroit scrap market is exceptionally strong, although transactions at current prices are at a low level, the recent price increases having failed as yet to bring out any large showing of scrap. A heavy December list of Fisher bundles was open for bids the first of the week and was expected to show some advance over last month's prices.

New York

Due to the end-of-year stock taking, small consumers have asked deliveries to take place before Dec. 21 or after Jan. 1, while large firms and dealers are taking all the scrap available. Deliveries to dealers were better this week. The market is very strong.

Boston

For the first time in many months the market can be classfied as real active. Prices are strong and generally 25c. to 50c. a ton higher than a week ago. Yard prices are up all of 75c. a ton, and export even more. For new orders the general market on skeleton is $13 to $13.50 a ton on cars, but better than $14 has been paid against old orders. The general market on breakable cast is $16 to $16.25 a ton on cars, but the Washburn Wire Co., Phillipsdale, R. I., which currently has stopped shipments, is reported to have paid $16.50 to $17 a ton, f.o.b. Reports better than $22 a ton delivered has been paid for textile cast are not confirmed. Textile machinery makers have large stocks of scrap on hand and will purchase more at not above $22. Two boats are loading here for England. The Quartermaster's Depot, Army base, Boston, will close bids Dec. 26 on about 800 tons of chips, turnings, heavy mixed and other kinds of scrap.

Toronto

In an effort to stimulate offerings of cast scrap and stove plate dealers advanced buying prices 50c. and 25c. a gross ton respectively during the week. Steel scrap prices, however, are unchanged but very firm. There appears to be an understanding with the government regarding steel scrap prices which retards any sharp upswing. Therefore, the mills are not raising their bids on steel purchased from domestic sources to forestall any forced advance in finished steel. Demand for both steel and iron scrap is expanding steadily and dealers report more difficulty in obtaining supplies, partly due to bad road conditions throughout the country.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$22.50 to $23.00
Railroad heavy mltng.	23.50 to 24.00
No. 2 heavy melting...	21.00 to 21.50
Railroad scrap rails..	24.00 to 24.50
Rails 2 ft. and under..	27.00 to 27.50
Comp. sheet steel.....	22.50 to 23.00
Hand bundled sheets.	21.00 to 21.50
Heavy steel axle turn.	21.00 to 21.50
Heavy steel forge turn.	20.00 to 20.50
Machine shop turnings	15.75 to 16.25
Short Shov. Turn. Alloy Free	17.00 to 17.50
Mixed bor. & turn....	15.50 to 16.00
Cast iron borings.....	16.25 to 16.75
Cast iron carwheels...	23.00 to 23.50
Heavy breakable cast.	17.50 to 18.00
No. 1 cupola cast.....	22.50 to 23.00
RR. knuckles & coup.	27.00 to 27.50
Rail coil springs.....	27.50 to 28.00
Rail leaf springs	27.50 to 28.00
Rolled steel wheels...	27.50 to 28.00
Low phos. billet crops.	27.50 to 28.00
Low phos. punchings.	27.50 to 28.00
Low phos. heavy plate.	25.50 to 26.50
Railroad malleable ...	26.00 to 26.50

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$20.50 to $21.00
No. 2 hvy. mltng. steel.	19.50 to 20.00
Hydraulic bund., new.	20.50 to 21.00
Hydraulic bund., old..	17.50 to 18.00
Steel rails for rolling.	25.00 to 26.00
Cast iron carwheels..	23.00 to 23.50
Hvy. breakable cast..	21.50 to 22.00
No. 1 cupola cast.....	23.00 to 23.50
Mixed yard (f'd'y) cast	20.00 to 20.50
Stove plate (steel wks.)	18.50 to 19.00
Railroad malleable	22.50 to 23.00
Machine shop turn....	15.00 to 15.50
No. 1 blast furnace..	.... 14.00
Cast borings	15.00 to 15.50
Heavy axle turnings..	19.00 to 19.50
No. 1 low phos. hvy...	26.00 to 26.50
Couplers & knuckles..	25.50 to 26.00
Rolled steel wheels...	25.50 to 26.00
Steel axles	25.00 to 25.50
Shafting	25.50 to 26.00
Spec. iron & steel pipe	18.00 to 18.50
Cast borings (chem.).	15.00

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton
Hvy. mltng. steel.....	$20.25 to $20.75
Auto. hvy. mltng. steel alloy free	19.25 to 19.75
No. 2 auto steel.....	17.00 to 17.50
Shoveling steel	20.25 to 20.75
Factory bundles	19.75 to 20.25
Dealers' bundles	18.25 to 18.75
No. 1 busheling	19.25 to 19.75
No. 2 busheling, old..	11.50 to 12.00
Rolled carwheels	23.75 to 24.25
Railroad tires, cut ...	24.00 to 24.50
Railroad leaf springs.	23.50 to 24.00
Steel coup. & knuckles	23.50 to 24.00
Axle turnings	19.50 to 20.00
Coil springs	25.00 to 25.50
Axle turn. (elec.).....	20.00 to 20.50
Los phos. punchings..	23.50 to 24.00
Low phos. plates 12 in. and under	24.00 to 24.50
Cast iron borings	14.25 to 14.75
Short shov. turn.....	14.75 to 15.25
Machine shop turn....	14.50 to 15.00
Rerolling rails	24.50 to 25.00
Steel rails under 3 ft..	23.50 to 24.00
Steel rails under 2 ft..	24.00 to 24.50
Angle bars steel	23.50 to 24.00
Cast iron carwheels...	21.50 to 22.00
Railroad malleable	24.00 to 24.50
Agric. malleable	18.50 to 19.00
	Per Net Ton
Iron car axles	$24.50 to $25.00
Steel car axles	24.50 to 25.00
Locomotive tires	18.75 to 19.25
Pipes and flues	14.50 to 15.00
No. 1 machinery cast..	19.00 to 19.50
Clean auto. blocks ...	18.00 to 18.50
No. 1 railroad cast....	18.00 to 18.50
No. 1 agric. cast.....	16.50 to 17.00
Stove plate	13.50 to 14.00
Grate bars	14.50 to 15.00
Brake shoes	14.50 to 15.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$23.00 to $23.50
No. 2 hvy. mltng. steel.	21.50 to 22.00
Low phos. plate	26.00 to 26.50
No. 1 busheling	22.00 to 22.50
Hydraulic bundles	22.50 to 23.00
Machine shop turn...	15.00 to 15.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$22.00 to $22.50
No. 2 hvy. mltng. steel.	21.00 to 21.50
Comp. sheet steel.....	$21.50 to $22.00
Light bund. stampings	18.00 to 18.50
Drop forge flashings..	20.50 to 21.00
Machine shop turn....	14.50 to 15.00
Short shov. turn.....	15.00 to 15.50
No. 1 busheling	21.25 to 21.75
Steel axle turnings...	21.50 to 22.00
Low phos. billet and bloom crops	27.00 to 27.50
Cast iron borings.....	15.50 to 16.00
Mixed bor. & turn....	15.50 to 16.00
No. 2 busheling	15.50 to 16.00
No. 1 Machinery cast..	23.50 to 24.00
Railroad cast	22.50 to 23.00
Railroad grate bars...	16.00 to 16.50
Stove plate	16.00 to 16.50
Rails under 3 ft.	27.00 to 28.00
Rails for rolling	25.50 to 26.00
Railroad malleable ...	25.00 to 25.50

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$22.00 to $22.50
No. 2 hvy. mltng steel.	20.00 to 20.50
Scrap rails	23.00 to 23.50
New hvy. b'ndled sheets	20.00 to 20.50
Old hydraul. bundles..	18.50 to 19.00
Drop forge flashings..	20.00 to 20.50
No. 1 busheling	20.00 to 20.50
Machine shop turn....	14.50 to 15.00
Shov. turnings	15.50 to 16.00
Mixed bor. & turn.....	14.50 to 15.00
Cast iron borings.....	14.50 to 15.00
Knuckles & couplers..	25.50 to 26.00
Coil & leaf springs....	25.50 to 26.00
Rolled steel wheels...	25.50 to 26.00
No. 1 machinery cast.	21.00 to 21.50
No. 1 cupola cast.....	19.50 to 20.50
Stove plate	17.50 to 18.00
Steel rails under 3 ft..	26.00 to 26.50
Cast iron carwheels...	19.00 to 20.00
Railroad malleable ...	24.50 to 25.00
Low phos. plate	27.00 to 28.00

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting.	$18.25 to $18.75
No. 1 hvy. melting...	18.25 to 18.75
No. 2 hvy. melting....	17.75 to 18.25
No. 1 locomotive tires.	21.00 to 21.50
Misc. stand. sec. rails	21.75 to 22.25
Railroad springs	23.25 to 23.75
Bundled sheets	14.00 to 14.50
Cast bor. & turn.....	11.00 to 11.50
Machine shop turn....	11.50 to 12.00
Heavy turnings	14.00 to 14.50
Rails for rerolling....	24.50 to 25.50
Steel car axles	25.75 to 26.25
No. 1 RR. wrought....	15.50 to 16.00
No. 2 RR. wrought....	17.25 to 17.75
Steel rails under 3 ft..	24.25 to 24.75
Steel angle bars	22.50 to 23.00
Cast iron carwheels...	21.75 to 22.25
No. 1 machinery cast..	21.00 to 21.50
Railroad malleable ...	22.00 to 22.50
Breakable cast	18.50 to 19.00
Stove plate	15.00 to 15.50
Grate bars	14.00 to 14.50
Brake shoes	15.00 to 15.50

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel	$19.00 to $19.50
No. 2 hvy. mltng. steel.	17.00 to 17.50
Scrap rails for mltng..	24.25 to 24.75
Loose sheet clippings.	13.50 to 14.00
Hyd'lic bundled sheets.	17.50 to 18.00
Cast iron borings	10.25 to 10.75
Machine shop turn....	11.00 to 11.50
No. 1 busheling	15.00 to 15.50
No. 2 busheling	8.50 to 9.00
Rails for rolling	25.25 to 25.75
No. 1 locomotive tires.	21.00 to 21.50
Short rails	26.25 to 26.75
Cast iron carwheels..	19.75 to 20.25
No. 1 machinery cast..	22.50 to 23.00
No. 1 railroad cast....	21.00 to 21.50
Burnt cast	13.75 to 14.25
Stove plate	13.75 to 14.25
Agricul. malleable ...	18.50 to 19.00
Railroad malleable ...	21.50 to 22.00
Mixed hvy. cast.	19.25 to 19.75

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting steel	....	$19.00
No. 2 hvy. melting steel	....	18.00
No. 1 busheling	....	17.00
Scrap steel rails	....	19.00
Steel rails under 3 ft..	....	21.00
Rails for rolling	....	20.00
Long turnings	....	9.50
Cast iron borings	....	8.50
Stove plate	....	12.50
Steel axles	....	19.00
No. 1 RR. wrought....	....	17.00
No. 1 cast	....	19.00
No. 2 cast	....	14.00
Cast iron carwheels...	....	20.00
Steel carwheels	....	19.00

DETROIT

Dealers' buying prices per gross ton, f.o.b. cars:

No. 1 heavy melting..	$17.00 to $17.50
No. 2 heavy melting..	16.00 to 16.50
Borings and turnings.	12.00 to 12.50
Machine shop turnings	12.00 to 12.50
Long turnings	9.50 to 10.00
Short shov. turnings..	12.50 to 13.00
No. 1 cast	18.50 to 19.00
Automotive cast	19.00 to 19.50
Hvy. breakable cast...	15.00 to 15.50
Stove plate	12.00 to 12.50
Hydraul. comp. sheets	19.00 to 19.50
New busheling	17.00 to 17.50
Sheet clips	14.50 to 15.00
Flashings	17.00 to 17.50
Low phos. plate	20.00 to 20.50

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel.	$16.00 to $16.50
No. 2 hvy. mltng. steel.	15.00 to 15.50
Hvy. breakable cast...	18.00 to 18.50
No. 1 machinery cast.	18.50 to 19.00
No. 2 cast	16.50 to 17.00
Stove plate	14.50 to 15.00
Steel car axles	21.50 to 22.00
Shafting	20.00 to 20.50
No. 1 RR. wrought....	17.50 to 18.00
No. 1 wrought long....	17.00 to 17.50
Spec. iron & steel pipe	13.00 to 13.50
Rails for rolling.....	20.00 to 20.50
Clean steel turnings*..	10.00 to 10.50
Cast borings*	10.50 to 11.00
No. 1 blast furnace...	9.00 to 9.50
Cast borings (chem.)..	11.50 to 12.00
Unprepared yard scrap	9.50 to 10.00
Light iron	6.50 to 7.00

Per gross ton delivered local foundries:

No. 1 machin. cast....	$20.00 to $21.00
No. 2 cast	17.50 to 18.00

* $1.50 less for truck loads.

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars:

No. 1 hvy. mltng. steel.	$15.75 to $16.00
No. 2 hvy. mltng. steel.	14.75 to 15.00
Breakable cast	16.00 to 16.25
Machine shop turn....	9.50 to 10.15
Mixed bor. & turn.....	9.25 to 9.50
Bun. skeleton long....	13.00 to 13.50
Shafting	19.75 to 20.00
Stove plate	13.50 to 13.65
Cast bor. chemical ...	9.75 to 10.00

Per gross ton delivered consumers' yards:

Textile cast	$20.00 to $22.00
No. 1 machine cast....	20.00 to 21.00

Per gross ton delivered dealers' yards:

No. 1 hvy. mltng. steel.....	$13.01
No. 2 steel	12.51

PACIFIC COAST

Per net ton delivered to consumer:

	San Fran.	Los Ang.	Seattle
No. 1 hvy. mltng. steel	$14.25	$13.25	$15.00
No. 2 hvy. mltng. steel		12.00	
Bundles		10.00	

CANADA

Dealers' buying prices at these yards, per gross ton:

	Toronto	Montreal
Low phos. steel.....	$13.00	$12.50
No. 1 hvy. mltng. steel.	11.25	10.75
No. 2 hvy. mltng. steel.	10.00	9.75
Mixed dealers steel...	8.75	8.25
Drop forge flashings...	9.75	9.25
New loose clippings...	8.75	8.25
Busheling	6.00	5.50
Scrap pipe	7.75	7.25
Steel turnings	7.50	7.00
Cast borings	7.50	7.00
Machinery cast	20.50	19.50
Dealers' cast	19.50	18.50
Stove plate	16.00	15.50

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered barges	
No. 1 hvy. mltng. steel.	$16.00
No. 2 hvy. mltng. steel.	15.00
No. 2 cast	$16.00 to 16.50
Stove plate	14.50 to 15.00
Boston on cars at Army Base or Mystic Wharf	
No. 1 hvy. mltng. steel.	$17.00 to $17.50
No. 2 hvy. mltng. steel.	15.50 to 16.00
Rail (scrap)	17.00 to 17.50
Philadelphia, delivered alongside boats, Port Richmond	
No. 1 hvy. mltng. steel.....	Nominal
No. 2 hvy. mltng. steel.....	Nominal

Construction Steel

. . .STRUCTURAL STEEL, REINFORCING BARS, PLATES, PILING, ETC.

Fabricated Steel

Lettings of 35,450 tons almost double those of a week ago; new projects drop to 30,550 tons from 72,610 tons last week; plate awards only 255 tons.

AWARDS

NORTH ATLANTIC STATES

5440 Tons, Brooklyn, elevated parkway contracts, B-13 and B-15, to Mount Vernon Bridge Co., Mount Vernon, Ohio.

1700 Tons, Schenectady, N. Y., hydraulic director building for General Electric Co., to Bethlehem Steel Co., Bethlehem, Pa.

1000 Tons, Deer Park, Long Island, reception buildings, to American Bridge Co., Pittsburgh.

830 Tons, Brooklyn, Hamilton Avenue bridge, to Mount Vernon Bridge Co., Mount Vernon, Ohio.

830 Tons, Woodhaven, N. Y., Woodhaven Boulevard, to American Bridge Co., Pittsburgh.

700 Tons, New York, apartment building, 120 Central Park South, to Dreier Structural Steel Co., New York.

264 Tons, Allegheny County, Pa., State highway bridge, to Fort Pitt Bridge Works Co., Pittsburgh.

202 Tons, Bellevue, Pa., building for Pennsylvania Bell Telephone Co., to American Bridge Co., Pittsburgh.

194 Tons, Butler, Pa., crane runway roof for American Rolling Mill Co., to Pittsburgh-Des Moines Steel Co., Pittsburgh.

137 Tons, Genesee County, N. Y., State highway bridge, to American Bridge Co., Pitsburgh.

133 Tons, Buffalo, addition to Buffalo Savings Bank, to Buffalo Structural Steel Co., Buffalo.

115 Tons, Quonset Point, R. I., cafeteria project No. 41, to Lehigh Structural Steel Co., Alentown, Pa.

THE SOUTH

718 Tons, Gadsden, Ala., machine shop for Government shell plant, to Ingalls Iron Works Co., Birmingham.

298 Tons, Laurel, Miss., power plant for Masonite Corp., to Ingalls Iron Works Co., Birmingham.

CENTRAL STATES

1200 Tons, Detroit, factory for Briggs Mfg. Co., to Whitehead & Kales Co., Detroit.

650 Tons, Youngstown, machine shop for United Engineering & Foundry Co., to American Bridge Co., Pittsburgh.

240 Tons, Detroit, addition for Fitzsimons Mfg. Co., to Whitehead & Kales Co., Detroit.

200 Tons, Lancaster, Ohio, A-H Glass plant, to Indiana Bridge Co., Muncie, Ind.

200 Tons, Mount Vernon, Ohio, Lamb Glass plant, to Riverside Steel Co., Wheeling, W. Va.

125 Tons, Chicago, office building addition for Central Steel & Wire Co., to American Bridge Co., Pittsburgh.

WESTERN STATES

10,000 Tons, San Diego, Cal., superstructure, Consolidated Aircraft Corp. plant addition, to Fort Pitt Bridge Works Co., Pittsburgh.

8000 Tons, Grand Coulee Dam, Wash., to Covington, Wash., transmission line towers for Bonneville Administration (Invitation 1522), to American Bridge Co., Pittsburgh.

1300 Tons, Mare Island, Cal., electric plant, steam test plant, and sub-assembly facilities at Navy Yard (Specifications 10,221), to Herrick Iron Works, Oakland, Cal.

500 Tons, Oakland, Cal., transit shed, shops, garage, fire house at Naval Supply Depot (Specifications 10,111), to Judson-Pacific Co., San Francisco, through K. E. Parker Co., San Francisco, contractor.

200 Tons, Earp, Cal., trashracks for Parker power plant (Bureau of Reclamation Specification 1453-D), to Valley Iron Works, St. Paul, Minn.

183 Tons, Bremerton, Wash., Navy Yard transportation building (Requisition NSA 641, Schedule 2590), to Isaacson Iron Works, Seattle.

100 Tons, Oakland, Cal., Judson Steel Corp. warehouse, to Judson-Pacific Co., San Francisco.

Unstated Tonnage, San Francisco, traveling hammerhead cranes at Hunters Point docks for Navy, to Star Iron & Steel Co., Tacoma, Wash.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

4000 Tons, Washington, Hotel Statler for Statler Co.

1850 Tons, Philadelphia, armor plate machine shop for Midvale Co.; United Engineers & Constructors, Inc., general contractor.

1000 Tons, New London, Conn., submarine railway cradle; previously reported 800 tons.

900 Tons, Buffalo, manufacturing building for Houde Engineering Co.

750 Tons, New York, reconstruction track stringers, Manhattan Bridge.

750 Tons, Buffalo plant for Fedders Mfg. Co.

600 Tons, Dayton, Pa., Mahoning Creek bridge for Baltimore & Ohio Railroad.

500 Tons, Pittsburgh, A. Leo Weil Elementary School.

400 Tons, Corning, N. Y., additional buildings for Corning Glass Co.

350 Tons, Hillsboro, R. I., State hangar.

340 Tons, Groveton, Pa., Blaw-Knox Co. machine shop extension.

300 Tons, Franklin-Windham, Conn., State bridge.

210 Tons, Cornwells Heights, Pa., Badenhausen Corp. drum shop.

200 Tons, Amherst Township, theatre for Guelich & Boebel Co., of Buffalo.

170 Tons, East Hartford, Conn., State highway bridge.

165 Tons, Browntown, N. J., State bridge.

THE SOUTH

300 Tons, Jefferson County, Ky., Adair Street State bridge.

200 Tons, Key West, Fla., submarine base facilities for Navy Department.

185 Tons, Mingo County, W. Va., West Nolan State overhead crossing.

140 Tons, Watts Bar Dam, Tenn., trashracks and guides, Cherokee Dam for TVA.

130 Tons, Sheffield, Ala., intake gates, guides, etc., Wilson power house for TVA.

120 Tons, Moundsville, W. Va., administration building and cell block, State Penitentiary.

CENTRAL STATES

4000 Tons, Columbus, Ohio, three warehouses for Government at Army depot on East Broad Street.

1300 Tons, St. Louis, manufacturing plant, warehouse and office building for Continental Can Co.

550 Tons, Canton, Ohio, factory buildings for Timken Roller Bearing Co.

350 Tons, Detroit, building for F. W. Woolworth Co.

260 Tons, Middletown, Ohio, American Rolling Mill Co. cold roll process building.

235 Tons, Dearborn, Mich., extension cold finishing mill for Ford Motor Co.

215 Tons, Dayton, Ohio, Sheffield Gage Co. factory and office building.

200 Tons, Cleveland, plant extension for White Motor Co.

190 Tons, St. Bernard, Ohio, Fishers' Bakery building.

175 Tons, State of Missouri, five highway projects.

160 Tons, East Liverpool, Ohio, Hall China Co. building addition.

155 Tons, Medford, Wis., State bridge No. 603.

150 Tons, Fort Atkinson, Wis., State bridge.

145 Tons, Fairmont, Neb., State viaduct.

135 Tons, Wyocena, Wis., State bridge.

125 Tons, Williams County, Ohio, St. Joseph River State bridge.

110 Tons, Cincinnati, stock house for Cliffside Brewing Co.

WESTERN STATES

1500 Tons, Oakland, Cal., aviation storage buildings at Naval Supply Depot; Clinton Construction Co., San Francisco, contractor.

1000 Tons, Berkeley, Cal., high school auditorium; bids soon.

526 Tons, Azusa, Cal., undercrossing; bids Jan. 9.

424 Tons, Terminous, Cal., bridge and trestle; bids Jan. 8.

175 Tons, Ogden, Utah, equipment repair building at Hill Field (Invitation QM-6585-41-55 (HF)); George A. Whitmeyer & Sons Co., Salt Lake City, general contractor.

CANAL ZONE

5675 Tons, fabricated material and miscellaneous parts, Panama Canal; bids open Jan. 2, General Purchasing Office, Panama Canal, Washington.

Weekly Bookings of Construction Steel

Week Ended ——→	Dec. 16, 1940	Dec. 10, 1940	Nov. 19, 1940	Dec. 18, 1939	Year to Date 1940	Year to Date 1939
Fabricated structural steel awards	35,450	18,800	22,725	9,300	1,128,710	908,475
Fabricated plate awards	255	815	2,600	0	143,200	149,895
Steel sheet piling awards	0	250	0	0	65,630	75,365
Reinforcing bar awards	6,110	10,700	11,860	8,300	459,305	439,485
Total Letting of Construction Steel	41,815	30,565	37,185	17,600	1,796,845	1,573,220

FABRICATED PLATES

AWARDS

255 **Tons,** New Orleans, molasses tank for U. S. Industrial Chemicals, Inc., to Ingalls Iron Works Co., Birmingham.

SHEET PILING

PENDING PROJECTS

500 **Tons,** Bremerton, Wash., Navy pier; Puget Sound Bridge & Dredging Co. and Rumsey & Co., Seattle, general contractors.

Reinforcing Steel

Awards of 6110 tons; 7265 tons in new projects

AWARDS

ATLANTIC STATES

1100 **Tons,** Queens, N. Y., Bureau of Sewers, contract No. 2, to Republic Steel Corp., Cleveland, through Carroll-McCreary Co., Inc.; Delhan Construction Co., contractors.

200 **Tons,** Elizabeth, N. J., Simmons Co. factory, to Bethlehem Steel Co., Bethlehem, Pa., through White Construction Co., contractor.

SOUTH AND CENTRAL

1100 **Tons,** Lawrenceburg, Ind., Belvedere Corp. warehouse, to Pollak Steel Co., Cincinnati, through Ferro Concrete Construction Co., contractor.

578 **Tons,** State of New Mexico, Rio Grande bridge project, to Truscon Steel Co., Youngstown, through International Boundary Commission.

250 **Tons,** Sardis Dam, Miss., relocation of Illinois Central Railway and Mississippi highway No. 7, to Laclede Steel Co., St. Louis, through Robinson & Young, general contractors, Baton Rouge, La.

250 **Tons,** Charleston, W. Va., post office, to West Virginia Rail Co.; T. G. Eagen Engineering Co., contractor.

200 **Tons,** Lake County, Ohio, State project No. 323, to Truscon Steel Co., Youngstown.

170 **Tons,** St. Louis County, Mo., bridge at Clayton and Warson Roads to Laclede Steel Co., St. Louis, through Blackwell Corp., general contractor, East St. Louis, Ill.

170 **Tons,** Danville, Ill., housing project, to Sheffield Steel Corp., Kansas City.

136 **Tons,** Jackson County, Ohio, State highway project No. 364, to West Virginia Rail Co.; Ralph Meyers Construction Co., contractor.

100 **Tons,** Portsmouth, Va., additions to naval hospital to Truscon Steel Co., Youngstown, through R. R. Richards Co. & Associates.

WESTERN STATES

750 **Tons,** Ogden, Utah, warehouses at Utah General Depot (Army Invitation QM-6585-41-48), to Bethlehem Steel Co., Bethlehem, Pa., through James A. Leck Construction Co. and Al Johnson, Minneapolis, contractors. Tonnage includes mesh.

380 **Tons,** Oakland, Cal., transit shed, garage, fire house, and public works shops at Naval Supply Depot (Specifications 10,-111), to Gilmore Fabricators, Inc., San Francisco, through K. E. Parker Co., San Francisco, general contractor.

250 **Tons,** San Francisco, State psychiatric hospital, to Gunn-Carle & Co., San Francisco, through Carl N. Swenson Co., San Jose, Cal., contractor.

123 **Tons,** Sunol, Cal., Silver Springs crossing, to San Jose Steel Co., San Jose, Cal., through Earl Heple, San Jose, contractor.

111 **Tons,** Portland, Ore., pumping plant, etc., for Sauvie Island Drainage District, to Soule Steel Co., Portland, Ore., through Kuckenberg Construction Co., Portland, contractor.

CANAL ZONE

243 **Tons,** Panama Canal, schedule No. 4566, to Joseph T. Ryerson & Son, Inc., Chicago.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

800 **Tons,** Philadelphia, Quartermaster depot buildings (7), Navy Yard; Wark & Co., contractors.

550 **Tons,** Brooklyn, elevated parkway, contract B-16; bids in.

220 **Tons,** Brooklyn, prospect Avenue grade separation (B-9); bids in.

125 **Tons,** Livingston County, Pa., highway bridge; bids in.

SOUTH AND CENTRAL

2000 **Tons,** Robertson, Mo., Curtiss-Wright Corp., expansion; H. B. Deal & Co., Inc., St. Louis, general contractor.

2000 **Tons,** St. Louis, Western Cartridge Co. ammunition plant.

300 **to 500 Tons,** St. Louis, Continental Can Co. factory.

300 **Tons,** Bluff City, Va., bridge.

230 **Tons,** Chicago, Commonwealth Edison Fisk Street station.

200 **Tons,** Harrisburg, Ill., pumping station.

180 **Tons,** Peoria, Ill., Elliott Street viaduct.

150 **Tons,** Cicero, Ill., Danley Mfg. Co. building.

WESTERN STATES

2000 **Tons,** Oakland, Cal., aviation storage building at Naval Supply Depot; Clinton Construction Co., San Francisco, contractor.

110 **Tons,** Terminous, Cal., bridge and trestle; bids Jan. 8.

Cast Iron Pipe

Maynard, Mass., has appropriated $65,000 for improvements to its water system and contemplates purchasing a tonnage of 10-in. pipe. Work will not start until spring.

War Department will install a fire water system at Fort Standish and Deer Island, Boston Harbor, requiring about 100 tons of pipe.

Water Department, Tulsa, Okla., plans new 30-in., 10-in., and 6-in. pipe for main water line extensions and replacements in several streets. Cost about $134,000. Financing is being arranged through Federal aid.

Petersburg, Mich., plans pipe lines for water system and other waterworks installation. Stewart-Kingscott Co., Kalamazoo, Mich., is engineer.

Metropolitan Utilities District, Eighteenth and Harney Streets, Omaha, Neb., plans pipe line extensions in water system in district bounded by Dodge, Pacific, Thirty-eighth and Forty-second Streets. Cost about $75,000.

Tri-Cities Fresh Water Supply District, Baytown, Tex., plans pipe lines for water system in district south of Baytown. Bond issue of $45,000 has been authorized.

Pleasant Hill County Water District, Pleasant Hill (Contra Costa County), Cal., plans pipe lines for water system and other waterworks installation. Bond issue of $125,000 has been approved.

King County Water District 63, Lakeridge (King County), Wash., plans pipe lines for water system and other waterworks installation. Surveys and estimates of cost are being made by Parker & Hill, Smith Tower Building, Seattle, consulting engineers.

Burbank, Cal., has taken bids on 225 tons of 8 and 10-in. pipe; National Cast Iron Pipe Co. is low bidder.

Compton, Cal., has taken bids on 187 tons 6, 8, and 10-in. pipe, with alternates on cast iron and asbestos cement.

San Bernardino, Cal., board of water commissioners, has awarded 32,800 ft. of 16-in. pipe as follows: Southern Pipe & Casing Co., Azusa, Cal., 10,500 ft. of 12 gage, 16-in. inside diameter pipe; Western Pipe & Steel Co., Los Angeles, 32,800 ft. of 10 gage, 16-in. inside diameter and 22,300 ft. of 3/16-in. gage, 16-in. inside diameter pipe.

Board of Water Commissioners, Long Beach, Cal., has authorized plans for extensions and replacements in water pipe line system in Naples district, now inadequate for requirements. Fred S. Porter, city manager, is in charge.

Board of Roads and Revenues, Marietta, Ga., has authorized fund of $45,000 to make total appropriation of $69,000, remainder of fund to be secured through Federal aid for pipe lines for water system in Jonesville and Fair Oaks districts, Cobb County. J. B. McCrary Co., Inc., Atlanta, Ga., is consulting engineer.

Crossville, Ill., plans pipe lines for water system and other waterworks installation, including elevated steel tank and tower and water softening plant. Kinzie Engineering Co., Pekin, Ill., is consulting engineer.

Bishop, Cal., plans pipe line extensions in water system; also new treatment plant and settling basin. Special election has been called Dec. 23 to vote bonds for $75,000 for project.

Pipe Lines

Kittery Oil Co., Casper, Wyo., plans 4-in. pressure cast iron welded joint pipe line from gas properties in Shackleford County, Tex., to point near Albany, Tex., about 14 miles, for natural gas transmission.

Leonard Pipe Line Co., Temple, Mich., has authorized immediate construction of new 4-in. pressure pipe line from new oil field in Winterfield Township, Clare County, Mich., to Temple, for crude oil transmission. Connection will be made with main pipe line system at latter place.

Nixon, Tex., plans pressure pipe line system for municipal natural gas distribution, including main welded steel pipe line for connection with supply source, control station and other operating facilities. Surveys and estimates of cost are being made by Beavers & Lodal, Smith-Young Tower Building, San Antonio, Tex., consulting engineers.

Pascagoula, Miss., has let contract to Littrell Contracting Co., Opelousas, La., at $291,100 for pressure pipe line system for municipal natural gas distribution, including welded steel pipe line for connection with supply source, meter house, control station and other operating facilities. Bond issue of $375,000 recently was approved for project. F. P. Joseph, Glenmora, La., is consulting engineer.

Hogan Brothers, Mount Pleasant, Mich., oil operators, plan pressure pipe line gathering system in connection with development of oil properties in Overisel, Mich., fields; also main pipe line for connection with proposed new tank farm in that area.

Board of Water Commissioners, San Bernardino, Cal., has awarded contracts to Southern Pipe & Casing Co., Azusa, Cal., for 10,500 ft. of 16-in., 10-gage steel pipe, at $1.15 per ft.; to Western Pipe & Steel Co., Vernon, Los Angeles, for 23,300 ft. of similar pipe, same gage, at $1.12 per ft., for extensions in main water system.

Northwestern Utilities, Ltd., Edmonton, Alta., plans welded steel pipe lines for extensions in natural gas transmission system near Calder, Alta. Cost close to $75,000.

Flagstaff, Ariz., will ask bids Dec. 30 for pipe lines, water treatment plant, pumping plant, and electric transmission line for Lake Mary water project. Bids will be taken on 26,733 ft. of 12-in. steel pipe for line from Lake Mary to water treatment plant and 19,290 ft. of 12-in. steel pipe from water treatment plant to city tie-in. Alternate bids will be received on 10-in. pipe and on asbestos cement pipe for certain portions. Bids will be taken also on 2592 ft. of class 150 cast iron pipe for last portion. Plans available from city clerk.

Trade Notes

Bastian-Blessing Company has taken over the distribution of the Forster torch line manufactured by Ransome Co. for the U. S. east of the Rocky Mountains. Forster torches are designed especially for use with butane and propane gases. The Bastian-Blessing sales organization and its distributers will handle the sale of this equipment. A complete stock of Forster torches will be maintained at the Bastian-Blessing plant in Chicago.

Nichol Machinery Co., Milwaukee, has moved its showroom and offices to new and larger quarters at 637 North Seventh Street, that city.

Users of S.A.E. 4640 steel have been notified that this gear steel is now carried in stock for immediate shipment by Joseph T. Ryerson & Son, Inc., Chicago. Stocks include hot rolled annealed rounds, in sizes from 1 in. to 5 in.

M. D. Friedman Co. announces removal of its office from Ashland, Ky., to Portsmouth, Ohio.

Prices of Finished Iron and Steel...

Steel prices on these pages are f.o.b. basing points (in cents per lb.) unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases freight absorbed to meet competition.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	
Long ternes[2]	3.80¢		3.80¢									4.55¢			
Wrought iron	4.75¢														
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢		
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢		
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢								
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢		
TIN PLATE Standard cokes (Per 100-lb. base box)	$5.00	$5.00	$5.00						$5.10						
BLACK PLATE 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ (10)			
TERNES, M'FG. Special coated (Per base box)	$4.30		$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢		
Reinforcing (rail)[7]	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢				2.40¢	2.45¢	2.15¢		
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢							2.70¢		
PLATES															
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Coatesville and Claymont = 2.10¢)		2.45¢	2.65¢		2.29¢	2.15¢
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)										
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Galvanized	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Spring	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)								
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			
IRON BARS															
Common		2.25¢			(Terre Haute, Ind. = 2.15¢)										
Refined	3.75¢														
Wrought	4.40¢														

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to 29 gage within certain width and length limitations. [6] For merchant trade. [7] Straight lengths as quoted by distributers. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lots to manufacturing trade. [10] Boxed.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher f.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Shell Steel

Basic open hearth shell steel f.o.b. Pittsburgh and Chicago.

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity. This type of steel is for hot rolled sections used for the forging of shells and includes rounds, round squares, and special sections.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)	*Per Lb.*
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 4/64 in., $3 a net ton higher. Quantity extras apply.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh; Package, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

WIRE PRODUCTS

(To the Trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham)

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cut nails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	56
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

Note: Birmingham base same on above items, except spring wire.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine and carriage bolts:	
½ in. and smaller by 6 in. and shorter	68
9/16 and ⅝ in. by 6 in. and shorter	66
¾ to 1 in. by 6 in. and shorter	64
1⅛ in. and larger, all lengths	62
All diameters over 6 in. long	62
Lag, all sizes	65
Plow bolts	68½
Hot pressed nuts; c.p.c., t-nuts; square, hex., blank or tapped:	
½ in. and smaller	66
9/16 to 1 in. inclusive	63
1⅛ in. to 1½ inclusive	61
1⅝ in. and larger	60

On above items, excepting plow bolts, additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts	U.S.S.	S.A.E.
½ in. and smaller	66	70
9/16 to 1 in.	63	65
1⅛ in. through 1½ in.	61	62
1⅝ in. and larger	60	..

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose	73 and 10
Stove bolts in packages, with nuts attached	73
Stove bolts in bulk	81

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York, lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.40

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 10

Cap and Set Screws

	Per Cent Off List
Milled hexagon head, cap screws, 1 in. dia. and smaller	50 and 10
Milled headless set screws, cut thread ¼ in. and larger	64
3/16 in. and smaller	73
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	70
Upset set screws, cup and oval points	75
Milled studs	52

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Dec. 11	Dec. 12	Dec. 13	Dec. 14	Dec. 16
Copper, Electrolytic[1]	12.00	12.00	12.00	12.00	12.00
Copper Lake	12.00	12.00	12.00	12.00	12.00
Tin, Straits, New York	50.05	50.05	50.05	....	50.05
Zinc, East St. Louis[2]	7.25	7.25	7.25	7.25	7.25
Lead, St. Louis[2]	5.35	5.35	5.35	5.35	5.35

[1] Mine producers' quotations only, delivered Conn. Valley. Deduct ¼c. for approximate New York delivery price. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Products

Cents per lb., Delivered

Tin	New York	Cleveland
Straits pig	51.25	53.75
Copper		
Electro	12.75	13.50
Castings	12.50	13.00
H. R. Sheets*	20.12	20.12
Seamless tubes*	20.62	20.62
Brass		
Yellow sheets*	18.65	18.65
Yellow, rods*	13.67	13.67
Seamless tubes*	21.40	21.40
Zinc		
Slabs	8.50	Nom'al
Sheets, No. 9 casks	12.50	Nom'al
Lead		
American pig	6.50	6.00
Bar	8.45	8.50
Cut sheets	8.80	8.75
Antimony		
Asiatic	16.00	17.00
Aluminum		
Virgin, 99%	20.00	21.00
No. 1 remelt., 98-99%	18.00	18.50
Solder		
½ and ½	30.750	32.00
Babbitt		
Anti-friction grade	23.50	21.50

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their use.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper		
Hvy. crucible	10.00	10.625
Hvy. and wire	9.00	9.40
Light and bottoms	8.00	8.50
Brass		
Heavy	5.750	6.255
Light	4.750	5.50
No. 1 yel. turn.	5.50	6.50
No. 1 red or compo. turnings	8.75	9.25
Hvy. Mach. compo.	9.00	9.375
Lead		
Heavy	4.50	5.00
Aluminum		
Cast	10.00	11.00
Sheet	13.00	14.00
Zinc	5.00	5.25

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cents plus, 17c.-18c. a lb.; No. 12 remelt No. 2, standard, 15.25-16c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $165-$168 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 13.25c. a lb.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras; on copper sheets, 33⅓; on brass sheets and rods, 40; on brass tubes, 33⅓, and copper tubes, 40.

ALLOY STEEL

Alloy Steel Blooms, Billets and Slabs

Base per gross ton, f.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem.....$54.00

Alloy Steel Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade ..... 2.70c.
Delivered, Detroit ..... 2.80c.

S.A.E. Series Numbers	Alloy Differential, per 100 Lb.
2000 (1.5 Ni)	$0.35
2100 (1.5 Ni)	0.75
2300 (3.5 Ni)	1.70
2500 (5 Ni)	2.55
3100 Ni-Cr	0.70
3200 Ni-Cr	1.35
3300 Ni-Cr	3.80
3400 Ni-Cr	3.20
4100 Cr-Mo (0.15 to 0.25 Mo.)	0.55
4100 Cr-Mo (0.25 to 0.40 Mo.)	0.75
x4340 Cr-Ni-Mo	1.70
4340 Cr-Ni-Mo	1.85
4600 Ni-Mo (0.2-0.3 Mo, 1.5-2 Ni)	1.20
5100 (0.60-0.90 Cr)	0.35
5100 (0.80-1.10 Cr)	0.45
5100 Cr spring steel	0.15
52-100 Cr. (electric furnace)	2.60
6100 Cr-V bar	1.20
6100 Cr-V spring steel	0.85
C-V	0.85

The above differentials are for hot rolled finished products. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

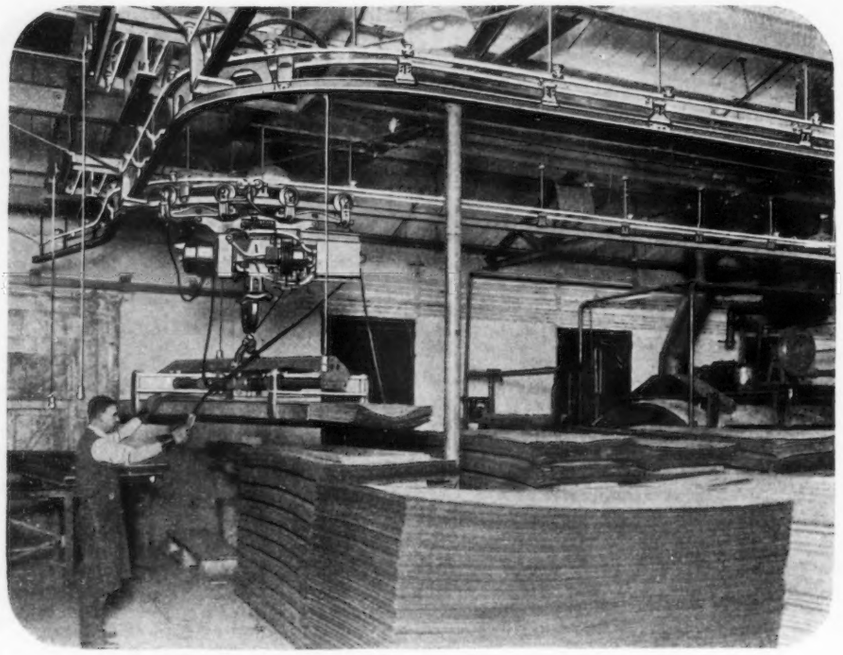
Alloy Cold-Finished Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. Delivered Detroit, 3.45c., carlots.

Alloy Steel Plates

Base per lb., f.o.b. Pittsburgh, Chicago and Coatesville.

Open hearth grade .....3.50c.



SIMPLE SHEET-HANDLING SYSTEM

MOVES UP TO 5 TONS QUICKLY and EASILY

Heavy loads of sheet steel are easily handled with a Cleveland Tramrail System. Motor-operated grabs, for floor or cab-controlled carriers, eliminate danger to workmen and to highly finished sheets. Aisle space is saved and piles may be higher, thus greatly increasing storage capacity of a given area.

It is worth your while to investigate the many cost-cutting possibilities of Cleveland Tramrail.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1115 Depot Street Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT
Other products: CLEVELAND CRANES and STEELWELD MACHINERY

STAINLESS AND HEAT-RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chromium-Nickel

No.	304	302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium

No.	410	430	442	446
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
H't strip	17.00c.	17.50c.	24.00c.	35.00c.
C'ld st.	22.00c.	22.50c.	32.00c.	52.00c.

TOOL STEEL

(F.o.b. Pittsburgh)

	Base per Lb.
High speed	67c.
High-carbon-chromium	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

ELECTRICAL SHEETS

(F.o.b. Pittsburgh)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. dock, San Francisco or Los Angeles or Seattle	56.00

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall

(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
1 in. o.d.13 B.W.G.	$9.01	$7.82	....
1¼ in. o.d.13 B.W.G.	10.67	9.26	....
1½ in. o.d.13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d.13 B.W.G.	13.42	11.64	11.06
2 in. o.d.13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d.13 B.W.G.	16.76	14.54	13.79
2¼ in. o.d.12 B.W.G.	18.45	16.01	15.16
2½ in. o.d.12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d.12 B.W.G.	21.42	18.59	17.54
3 in. o.d.12 B.W.G.	22.48	19.50	18.35
3½ in. o.d.11 B.W.G.	28.37	24.62	23.15
4 in. o.d.10 B.W.G.	35.20	30.54	28.66
4½ in. o.d.10 B.W.G.	43.04	37.35	35.22
5 in. o.d. 9 B.W.G.	54.01	46.87	44.25
6 in. o.d. 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft, to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought iron pipe)

Base Price=$200 Per Net Ton

Butt Weld

Steel	Black	Galv.
⅛ in.	56	36
¼ to ⅜ in.	59	43½
½ in.	63½	54
¾ in.	66½	58
1 to 3 in.	68½	60½

Wrought Iron	Black	Galv.
¼ and ⅜ in.	+9	+10
½ in.	24	6½
¾ in.	30	13
1 and 1¼ in.	34	19
1½ in.	38	21½
2 in.	37½	21

Lap Weld

Steel		
2 in.	61	52½
2½ and 3 in.	64	55½
3½ to 6 in.	66	57¼
7 and 8 in.	65	55½
9 and 10 in.	64½	55
11 and 12 in.	63½	54
Wrought Iron		
2 in.	30½	15
2½ to 3½ in.	31½	17½
4 in.	33½	21
4½ to 8 in.	32½	20
9 to 12 in.	28½	15

Butt weld, extra strong, plain ends

Steel	Black	Galv.
⅛ in.	54½	41½
¼ to ⅜ in.	56½	45½
½ in.	61½	53½
¾ in.	65½	57½
1 to 3 in.	67	60
Wrought Iron		
¼ and ⅜ in.	+10	+43
½ in.	25	9
¾ in.	31	15
1 to 2 in.	38	22½

Lap weld, extra strong, plain ends

Steel		
2 in.	59	51½
2½ and 3 in.	63	55½
3½ to 6 in.	66½	59
7 and 8 in.	65½	56
9 and 10 in.	64½	55
11 and 12 in.	63½	54
Wrought Iron		
2 in.	33½	18½
2½ to 4 in.	39	25½
4½ to 6 in.	37½	24
7 and 8 in.	38½	24½
9 to 12 in.	32	20½

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

The clam-shell drops its load of scrap into an acid-proof tank

Crash! goes a half ton of scrap into an acid-proof brick-lined tank — where strong, hot acid reacts with the iron to form ferrous and ferric chloride. This is the process by which one of the nation's leading chemical companies produces ferric chloride.

Twice a day for the past six years the tank has been so treated. It is just about the toughest kind of service to which an acid-proof tank lining is ever subjected. The cement in which the bricks are laid and bonded is Penchlor Acid-Proof Cement,* so strong and durable that it easily withstands even such harsh treatment as this. And it is absolutely inert to all acids except hydrofluoric.

Penchlor Acid-Proof Cement is used to bond the brick lining of pickling tanks by Carnegie-Illinois Steel Corp. and other large producers. It is quick-setting and self-hardening, saving construction and maintenance time. It adheres strongly to such materials as brick, steel, carbon, glass, rubber, and lead.

For extremely abrasive conditions, unusually high temperatures or severe thermal shock, another Pennsalt product, Asplit Cement,* offers utmost durability and prevents spalling of bricks. Several large steel producers use Asplit in continuous pickling tanks operating at 210°F. Pennsylvania Salt Mfg. Co., Widener Bldg., Phila., Pa.—New York • Chicago • St. Louis • Pittsburgh • Tacoma • Wyandotte.

WRITE FOR FREE TEST KIT. You can prove the outstanding properties of these acid-proof cements for yourself, and make a convincing comparison with the product you are now using, by means of the free test kit supplied on request. Write us today on your business letterhead.

*Fully protected by *existing* patents.

PENNSYLVANIA SALT MANUFACTURING COMPANY

Chemicals

ORES

Lake Superior Ores

Delivered Lower Lake Ports

	Per Gross Ton
Old range, bessemer, 51.50%..	$4.75
Old range, non-bessemer, 51.50%	4.60
Mesaba, bessemer, 51.50%.....	4.60
Mesaba, non-bessemer, 51.50%.	4.45
High phosphorus, 51.50%.....	4.35

Foreign Ores*

C.i.f. Philadelphia or Baltimore, Exclusive or Duty

	Per Unit
Algerian, low P, Cu free, dry, 55 to 58% Fe	Nom.
Caucasian, washed, 52% Mn.	Nom.
African, Indian, 44 to 48% Mn.	50c.
African, Indian, 49 to 51% Mn.	54c.
Brazilian, 46 to 48% Mn.	50c.
Cuban, del'd, duty free, 51% Mn.	68c.

	Per Short Ton Unit
Tungsten, Chinese, Wolframite, duty paid, delivered	$23 to $24
Tungsten, domestic scheelite, delivered	$23.00
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton: South African (low grade)	Nom.
Rhodesian, 45%	$23.50
Rhodesian, 48%	27.50

RAILS, TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., gross ton	$40.00
Angle bars, 100 lb.	2.70

F.o.b. Basing Points

Light rails (from billets), gross ton	$40.00
Light rails (from rail steel), gross ton	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts, steam railroads	4.15c.
Track bolts, discount to jobbers all sizes (per 100 counts)	65-5

Basing points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minneaqua, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond, Va.

FLUORSPAR *Per Net Ton*

Domestic washed gravel, 85-5 f.o.b. Kentucky and Illinois mines, all rail	$20.00 to $21.00
Domestic, f.o.b. Ohio River landing barges	20.00 to 21.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines	20.00 to 21.00
Foreign, 85% calcium fluoride, not over 5% Si., c.i.f. Atlantic ports, duty paid	Nominal
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	31.00
As above, in bags, f.o.b. same mines	32.60

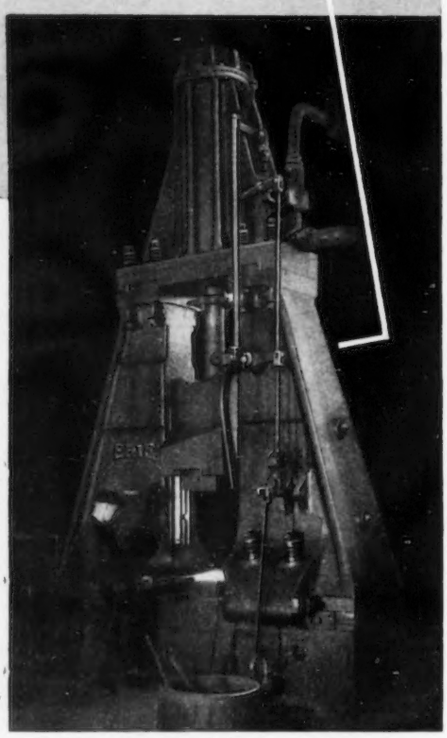
REFRACTORIES

Fire Clay Brick	*Per 1000 f.o.b. Works*
Super-duty brick at St. Louis	$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1 Ohio	39.90
Ground fire clay, per ton	7.10
Silica Brick	
Pennsylvania	$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement, net ton (Eastern)	8.55
Chrome Brick	*Net per Ton*
Standard f.o.b. Baltimore, Plymouth Meeting and Chester	$50.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	50.00
Magnesite Brick	
Standard f.o.b. Baltimore and Chester	$72.00
Chemically Bonded, f.o.b. Baltimore	61.00
Grain Magnesite	
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	(—)*
Domestic, f.o.b. Baltimore and Chester in sacks	$40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

*None available.

in ERIE HAMMER Frames

Plenty OF BACKBONE TO STAND THE GAFF



Wham! The ram strikes the piece of glowing metal. Wham . . Wham, day after day, year after year, impact forces measured in thousands of tons develop heavy stresses in every direction in the hammer frames.

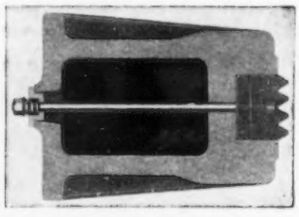
To withstand these shock loads and to hold the dies in match, Erie Drop Hammers have the strongest frames ever used on a hammer. Erie frames have a massive box section reinforced by heavy ribs running down the outside corners that add strength and rigidity. Heavy horizontal ribs, inside and outside, carry the thrust of the ram into the front and back walls.

These are some of the main reasons why Erie Hammers are nationally known for their ability to stand the gaff under heavy production schedules. They are important facts to remember when buying your next hammer.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U.S.A.

DETROIT 336 Curtis Bldg. · CHICAGO 549 Washington Blvd. · INDIANAPOLIS 336 Postal Station Bldg.
FRANCE Fenwick, S. A. · CANADA John Bertram & Sons Co. Ltd. · ENGLAND Burton, Griffiths & Co., Ltd.

ERIE



The great ruggedness of the combined I-beam and box frame construction of Erie Hammers is evident in this cross-section view.

ERIE BUILDS *Dependable* HAMMERS

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload).....$120.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%.....$36.00
Domestic, 26 to 28%..... 49.50

Electric Ferrosilicon

Per Gross Ton, Delivered, Lump Size

50% (carload lots, bulk).....$74.50*
50% (ton lots, packed)..... 87.00*
75% (carload lots, bulk).....135.00*
75% (ton lots, packed).....151.00*

Bessemer Ferrosilicon

Per Gross Ton, F.o.b. Jackson, Ohio

10.00 to 10.50%.....$33.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2% $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton, F.o.b. Jackson, Ohio

5.00 to 5.50%.....$27.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots Lump Size, on Contract

4 to 6% carbon.....11.00c.
2% carbon .....17.50c.
1% carbon .....18.50c.
0.10% carbon .....20.50c.
0.06% carbon .....21.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon $113.00*
2.50% carbon 118.00*
2% carbon 123.00*
1% carbon 133.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W, del. carload..... $2.00
Ferrotungsten, 100 lb. and less 2.25
Ferrovanadium, contract, per lb. contained V, del'd $2.70 to $2.90†
Ferrocolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., ton lots ..... $2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace, carload and contract, per net ton.....$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton.....$157.50

*Spot prices are $5 per ton higher.
†Spot prices are 10c. per lb. of contained element higher.

Ferrophosphorus, electric or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton 58.50

Ferrophosphorus, electrolytic 23-26% in carlots, f.o.b. Monsato (Siglo), Tenn., 24%, per gross tons, $3 unitage, freight equalized with Nashville 75.00

Ferromolybdenum, per lb. Mo, f.o.b. furnace ..... 95c.

Calcium molybdate, per lb. Mo, f.o.b. furnace ..... 80c.

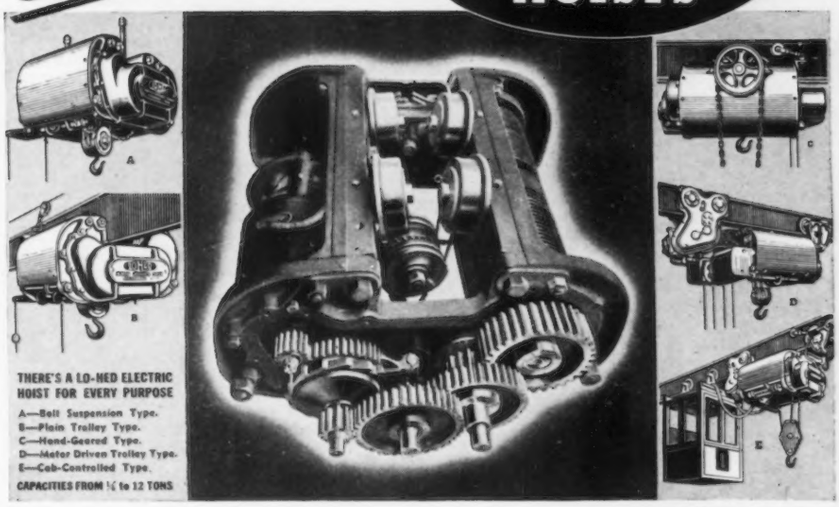
Molybdenum oxide briquettes 48-52% Mo, per lb. contained Mo, f.o.b. Langeloth, Pa. 80c.

FUEL OIL

No. 3, f.o.b. Bayonne, N J.....4.50c.
No. 6, f.o.b. Bayonne, N. J.....2.98c.
No. 5 Bur. Stds., del'd Chicago..3.25c.
No. 6 Bur. Stds., del'd Chicago..2.75c.
No. 3 distillate, del'd Cleveland..5.25c.
No. 4 industrial, del'd Cleveland.5.00c.
No. 5 industrial, del'd Cleveland.4.25c.
No. 6 industrial, del'd Cleveland.3.63c.

Good Hoists

A-E-CO LO-HED Time-tested HOISTS


THERE'S A LO-HED ELECTRIC HOIST FOR EVERY PURPOSE
A—Belt Suspension Type.
B—Plain Trolley Type.
C—Hand-Geared Type.
D—Motor Driven Trolley Type.
E—Cab-Controlled Type.
CAPACITIES FROM ½ to 12 TONS

GOOD FOR ALL PURPOSES

If you called the Lo-Hed Hoist the low headroom hoist your description would be right but not complete. Possibly 10% have bought a Lo-Hed because it is the original low headroom hoist, the other 90%—numbering thousands of customers and hoists—because the Lo-Hed is a hoist good for *all* purposes. It's easy to service, operates on any track, is noted for exceptionally low maintenance, is protected against dust, moisture, is fast, safe and fool-proof, and is furnished in a wide range of types and sizes for applications in any industry you can name. You can see for yourself from the open-view on this page that the Lo-Hed Hoist has every worthwhile feature a good all-purpose hoist needs. Look at these time-tested features: Heavy duty hoist type motor, automatic lowering brake, anti-friction bearings, stub tooth spur gears, plow-steel cable, 100% positive automatic upper limit stop, dust and moisture-proof controller. (Construction varies slightly for classes of Lo-Heds.) Investigate Lo-Hed time-tested construction. Write today for the complete Lo-Hed Catalog shown below.

AMERICAN ENGINEERING COMPANY

2410 Aramingo Avenue, Phila., Pa.

OTHER A-E-CO PRODUCTS: TAYLOR STOKERS MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

Look in your classified telephone directory under "A-E-CO LO-HED HOISTS" for your nearest representative.

MAIL THIS COUPON NOW

AMERICAN ENGINEERING COMPANY
2410 Aramingo Avenue, Philadelphia, Pa.
☐ Please send me your 26 page complete catalog of Lo-Hed Hoists.
☐ Ask your representative to call.
Name .....
Company .....
Street Address .....
City ..... State.....
(Please print plainly)

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, prompt .....$5.25 to $5.75

Foundry, f.o.b. Connellsville, prompt .....5.50 to 5.75

F'dry, by-product, Chicago..... 10.50

F'dry, by-product, New England 13.00

Foundry, by-product, Newark or Jersey City .....$11.30 to $11.90

F'dry, by-product, Philadelphia. 11.13

F'dry, by-product, Cleveland... 11.55

F'dry, by-product, Cincinnati... 11.00

Foundry, Birmingham 7.50

F'dry, by-product, St. Louis $10.75 to $11.00

Foundry, from Birmingham, f.o.b. cars dock Pacific ports.....$14.75

BRITISH

British

Per Gross Ton, f.o.b. United Kingdom Ports

Ferromanganese, export.£17 18s.

Tin plate, per base box. 32s. to 33s.

Steel bars, open hearth.£13 9s.

Beams, open hearth....£12 2s. 6d.

Channels, open hearth..£12 2s. 6d.

Angles, open hearth....£12 2s. 6d.

Black sheets, No. 24, gage £18 17s. 6d. max.*; £18 17s. 6d. min.**

Galvanized sheets, No. 24 gage £19 10s. max.*; £19 10s. min.**

*Empire markets only.
**Other than Empire markets.

PIG IRON (Per Gross Ton)

Prices delivered various consuming points indicated by bold italics

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos.
Boston	***$24.50***	***$24.00***	***$25.50***	***$25.00***	.....
Brooklyn	***26.50***	.....	.....	***27.00***	.....
Jersey City	***25.53***	***25.03***	***26.53***	***26.03***	.....
Philadelphia	***24.84***	***24.34***	***25.84***	***25.34***	.....
Bethlehem, Pa.	$24.00	$23.50	$25.00	$24.50	.....
Everett, Mass.	24.00	23.50	25.00	24.50	.....
Swedeland, Pa.	24.00	23.50	25.00	24.50	.....
Steelton, Pa.	.....	23.50	.....	.....	28.50
Birdsboro, Pa.	24.00	23.50	25.00	24.50	28.50
Sparrows Point, Md.	24.00	23.50	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....
Neville Island, Pa.	23.00	22.50	23.50	23.00	.....
Sharpsville, Pa.††	23.00	22.50	23.50	23.00	.....
Buffalo	23.00	22.00	24.00	23.50	28.50
Cincinnati	***23.44***	***23.61***	.....	***24.11***	.....
Canton, Ohio	***24.39***	***23.89***	***24.89***	***24.39***	.....
Mansfield, Ohio	***24.94***	***24.44***	***25.44***	***24.94***	.....
St. Louis	***23.50***	***23.02***	.....	.....	.....
Chicago	23.00	22.50	23.50	23.00	.....
Granite City, Ill.	23.00	22.50	23.50	23.00	.....
Cleveland	24.00	23.50	24.50	24.00	.....
Hamilton, Ohio	23.00	22.50	.....	23.00	.....
Toledo	24.00	23.50	24.50	24.00	.....
Youngstown††	23.00	22.50	23.50	23.00	.....
Detroit	23.00	22.50	23.50	23.00	.....
St. Paul	***26.63***	.....	***27.13***	***26.63***	.....
Duluth	24.50	.....	25.00	24.50	.....
Birmingham	19.38*	18.00	24.00	.....	.....
Los Angeles, San Francisco and Seattle	***27.50***	.....	.....	.....	.....
Provo, Utah	22.00	.....	.....	.....	.....
Montreal†	27.50	27.50	.....	28.00	.....
Toronto†	25.50	25.50	.....	26.00	.....

GRAY FORGE

Valley or Pittsburgh fce.....$23.50

CHARCOAL

Lake Superior fce.....$27.00
Delivered Chicago 30.34

Base prices are subject to an additional charge for delivery within the switching limits of the respective districts.

*Delivered prices on Southern iron for shipment to Northern points are 38c. a ton below delivered prices from nearest Northern basing point on iron with phosphorus content of 0.70 per cent and over. †On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

WAREHOUSE PRICES

(Base Prices, Dollars per 100 lb., Delivered Metropolitan Areas)

	Pittsburgh	Chicago	Cleveland	Philadelphia	New York	Detroit	Buffalo	Boston	Birmingham	St. Louis	St Paul	Milwaukee	Los Angeles
Sheets, hot rolled	$3.15	$3.05	$3.15	$3.35	$3.38	$3.23	$3.05	$3.51	$3.45	$3.19	$3.30	$3.48	$4.30
Sheets, cold rolled	....	4.10	4.05	4.05	4.40	4.30	4.30	4.58	....	4.12	4.35	4.43	6.50
Sheets, galvanized	4.75	4.60	4.42	4.75	4.55	4.64	4.40	4.66	4.75	4.95	4.75	4.98	5.25
Strip, hot rolled	3.40	3.40	3.30	3.75	3.76	3.48*	3.62	3.86	3.70	3.54	3.65	3.73	....
Strip, cold rolled	3.20	3.30	3.20	3.31	3.31	3.20	3.22	3.26	....	3.41	3.83	3.54	....
Plates	3.40	3.55	3.40	3.55	3.76	3.60	3.62	3.85	3.35	3.47	3.80	3.68	4.00
Structural shapes	3.40	3.55	3.58	3.55	3.75	3.65	3.40	3.85	3.55	3.69	3.80	3.68	4.15
Bars, hot rolled	3.35	3.50	3.25	3.85	3.84	3.43	3.35	3.98	3.50	3.64	3.75	3.63	4.15
Bars, cold finished	3.65	3.75	3.75	4.06	4.09	3.80	3.75	4.13	4.43	4.02	4.34	3.88	6.60
Bars, ht. rld. SAE 2300	7.20	7.10	7.55	7.31	7.35	7.42	7.35	7.50	....	7.47	7.45	7.33	9.40
Bars, ht. rld. SAE 3100	5.75	5.65	5.85	5.86	5.90	5.97	5.65	6.05	....	6.02	6.00	5.88	8.55
Bars, cd. drn. SAE 2300	8.15	8.15	8.15	8.56	8.59	8.45	8.40	8.63	....	8.52	8.84	8.38	10.65
Bars, cd. drn. SAE 3100	6.75	6.75	6.75	7.16	7.19	7.05	6.75	7.23	....	7.12	7.44	6.98	9.80

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb.; galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions: Chicago, galvanized sheets, 500 to 1499 lb.; Philadelphia, galvanized sheets, one to nine bundles, cold rolled sheets, 1000 to 1999 lb.; Detroit, galvanized sheets, 500 to 1499 lb.; Buffalo, cold rolled sheets, 500 to 1500 lb., galvanized sheets, 450 to 1499 lb.; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; Birmingham, hot rolled sheets, strip and bars, plates and shapes, 400 to 3999 lb., galvanized sheets, 500 to 1499 lb.; St. Louis, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb.; Milwaukee, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 150 to 499 lb.; New York, hot rolled sheets, 0 to 1999 lb., cold rolled sheets, 400 to 1499 lb.; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lb.; Los Angeles, hot rolled sheets, bars, plates, shapes, cold rolled sheets, 300 to 1999 lb., galvanized sheets, 150 to 1049 lb. Extras for size, quality, etc., apply on above quotations. *12 gage and heavier, $3.23.

New!

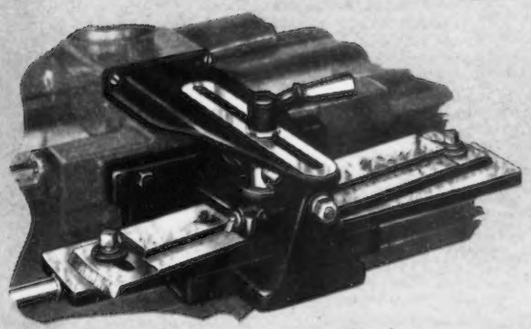
South Bend Series "S" Tool Room Precision Lathe

16" x 6' South Bend Series "S" Underneath Belt Motor Driven Tool Room Precision Lathe.

THE NEW South Bend Series "S" Tool Room Precision Lathe has been designed and built for efficient service in the modern tool room. Standard equipment includes draw-in collet chuck attachment, micrometer carriage stop, thread dial, chip pan, collet rack, and telescopic taper attachment.

Spindle speeds range from 21 to 725 R.P.M. Quick change gear box makes all threads and feeds instantly available. Large diameter hand wheels, clear-cut easy reading graduations, and conveniently arranged controls reduce operator fatigue, and assure maximum production.

Smooth vibration-free operation at high speed is assured by the direct belt drive to the spindle. A wrenchless bull gear lock permits engaging the back-gears quickly when slow speeds are required for machining large diameters.



TELESCOPIC TAPER ATTACHMENT

Turns and bores tapers up to 3½ inches per foot smoothly, easily, and accurately. Telescopic feature eliminates necessity of disconnecting cross feed screw when taper attachment is in use..

Boston Sales Office: 67 Broadway, Kendall Sq., Cambridge, Mass., Tel. Trowbridge 6369
Chicago Sales Office: Room 308, Machinery Sales Building, Telephone State 7283

WE FAVOR ADEQUATE PREPAREDNESS FOR NATIONAL DEFENSE

SOUTH BEND LATHE WORKS

LATHE BUILDERS SINCE 1906

591 E. Madison St., South Bend, Ind., U.S.A.

TRADE MARK SOUTH BEND TWIN ENGINE LATHES

Sales Possibilities

. . . CONSTRUCTION, PLANT EXPANSION AND EQUIPMENT BUYING

North Atlantic States

• **Chandler-Evans Co.,** Evansville Avenue, South Meriden, Conn., aircraft parts and equipment, plans three one-story additions, 240 x 250 ft., 120 x 160 ft., and 100 x 150 ft.; also new administration building. Cost close to $1,000,000 with equipment. Austin Co., Cleveland, is engineer and contractor.

Meisel Press Mfg. Co., 944 Dorchester Avenue, Dorchester, Boston, printing presses and parts, cut gears, etc., has let general contract to Karl F. Jackson, 214 High Street, for two-story and basement addition. Cost over $65,000 with equipment.

American Bosch Corp., Springfield, Mass., automobile and diesel engine injection apparatus, hot water heaters, etc., has leased four-story building at Providence, R. I., about 53,000 sq. ft. of floor space, with option to purchase, for branch plant for production of fuel injectors for diesel engines for Navy Department.

Worthington Pump & Machinery Corp., 37 Appleton Street, Holyoke, Mass., will ask bids soon on general contract for one-story addition, 100 x 350 ft. Cost over $150,000 with equipment. Main offices are at Harrison, N. J.

Whitney-Blake Co., Dixwell Avenue, New Haven, Conn., insulated wire and cable, has let general contract to Sperry & Treat Co., 294 Kimberly Street, for one-story addition and improvements in present plant. Cost about $50,000 with equipment. Westcott & Mapes, 139 Orange Street, are architects and engineers.

Stanley Tools, Division of Stanley Works, New Britain, Conn., will begin superstructure soon for seven-story addition, 60 x 80 ft., for which general contract recently was let to Turner Construction Co., 420 Lexington Avenue, New York. Cost over $175,000 with equipment.

Coca-Cola Bottling Co. of Boston, 30 Washington Street, Brighton, Boston, plans new one-story mechanical-bottling, storage and distributing plant in Soldiers' Field district. Cost close to $100,000 with equipment. Jesse M. Shelton, Bona Allen Building, Atlanta, Ga., is architect.

American Brake Shoe & Foundry Co., 230 Park Avenue, New York, has let general contract to Universal Construction Co., Scarritt Building, Kansas City, Mo., for two-story and basement addition to branch plant at North Kansas City, Mo. Cost close to $75,000 with equipment.

Rolled Metal Sections Co., 34-05 Thirty-first Street, Long Island City, steel parts for aircraft, etc., has purchased one-story building at 26-10 Fourth Street for plant, expanding present capacity.

Edo Aircraft Corp., College Point, N. Y., airplane floats and other aircraft equipment, plans one-story addition, about 40,000 sq. ft. Cost about $365,000 with equipment, in which amount company has arranged financing with Defense Plant Corp., an interest of RFC, Washington.

Celanese Corp. of America, Inc., 180 Madison Avenue, New York, rayon products, has let general contract to George F. Hazelwood Co., Cumberland, Md., for two-story and basement addition, 125 x 130 ft., to main mill at Amcelle, Md. Cost over $250,000 with equipment.

Crucible Steel Corp. of America, Inc., 405 Lexington Avenue, New York, plans seven one-story additions to mill at Harrison, N. J., including three separate structures for production of anti-aircraft guns and other guns and allied equipment for Government. Capacity of present electric furnaces will be doubled, with other expansion in machine works, steel melting, heating and treating divisions. Cost over $1,500,000 with equipment.

Arch-Built Corrugated Products Corp., 55 Thirty-third Street, Brooklyn, metal boxes and containers, has leased plant owned by Vulcan Rail & Construction Co., at 52-04 Grand Street, Maspeth, L. I., consisting of one and two-story buildings, totaling about 100,000 sq. ft. of floor space, and will occupy following completion of improvements in January. Capacity will be increased at new location.

Pelotto Corp., New York, care of Allan D. Emil, 170 Broadway, attorney, organized to manufacture aircraft precision instruments and parts, has let general contract to Austin Co., Cleveland, for three-story plant at 15-33 Sixty-ninth Street, Elmhurst, L. I. Cost over $80,000 with equipment. A. A. Rothman is company architect.

Beverwyck Breweries, Inc., 56 North Ferry Street, Albany, N. Y., has let general contract to Cassidy & Gallagher Co., 11 South Lake Avenue, for two-story and basement brewery, 90 x 120 ft. Cost over $80,000 with equipment. Harley & Ellington, Inc., Stroh Building, Detroit, is architect and engineer.

Union Steel Chest Corp., LeRoy, N. Y., tool chests, boxes and containers, plans one-story addition. Cost close to $50,000 with equipment.

Pfaudler Co., 89 East Avenue, Rochester, N. Y., alloy steel tanks, mixers, etc., plans two-story and basement addition, 80 x 120 ft. Cost close to $100,000 with equipment. William G. Kaelber and L. A. Waasdorp, 311 Alexander Street, are architects.

National Oil Products Co., Essex Street, Harrison, N. J., soluble and other refined oil products, is arranging fund of about $650,000 for plant expansion through sale of bond and stock issues to total over $1,700,000. Of amount first noted, approximately $350,000 will be expended at Harrison for buildings and equipment; $150,000 for one-story additions to branch plant at Cedartown, Ga., and a like sum for new plant on Pacific Coast to replace present leased property.

Simmons Co., 230 Park Avenue, New York, bed springs, spring mattresses, etc., has let general contract to White Construction Co., 95 Madison Avenue, for additions to branch plant at Linden, N. J., and improvements in present structures, totaling over 100,000 sq. ft. of floor space. Cost close to $325,000 with equipment. Albert A. Kaufmann, 259 North Broad Street, Elizabeth, N. J., is architect.

Fleetwings, Inc., Radcliffe Street, Bristol, Pa., stainless steel aircraft parts, plans one-story addition. Cost close to $175,000 with equipment. Leroy A. Riegel, 219 East Hanover Street, Trenton, N. J., is architect.

Modern Tool & Die Co., 419 Luray Street, Philadelphia, tools, dies, gages, etc., has purchased one-story building at 6019-29 Keystone Street, on site 125 x 150 ft., and will modernize for branch plant to double present capacity.

Edgcomb Steel Co., D Street and Erie Avenue, Philadelphia, has approved plans for one-story addition, 85 x 110 ft., for storage and distribution. Cost over $60,000 with equipment. Austin Co., Cleveland, is engineer and contractor.

Pennsylvania Power & Light Co., Allentown, Pa., plans addition to Hauto steam-electric generating plant, near Mauch Chunk, Pa., with installation of new 25,000-kw. turbine-generator unit, high-pressure boilers and auxiliary equipment. Cost about $5,000,000, including transmission line extensions.

Curtiss-Wright Corp., Curtiss Propeller Division, Neville Island, Pittsburgh, plans new one-story plant, 600 x 700 ft., near present works. Cost over $2,000,000 with equipment. Albert Kahn Associated Architects & Engineers, Inc., Detroit, is architect and engineer.

Reading Steel Casting Co., Reading, Pa., division of American Chain & Cable Co., Bridgeport, Conn., will begin superstructure for one and three-story addition, 105 x 120 ft., for expansion in foundry and machine shops. Cost over $100,000 with equipment. E. A. Rieder, 110 South Tenth Street, is general contractor. Muhlenberg, Yerkes & Muhlenberg, Ganster Building, are architects.

Pennsylvania Furnace & Iron Co., Warren, Pa., steel tanks and other products, has begun work on two one-story additions, 50 x 100 ft., and 50 x 60 ft., respectively, for which separate contracts recently have been let. Cost over $65,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Dec. 27 for two diesel engine electric traveling jib cranes for naval supply depot, Oakland, Cal. (Specification 10174).

Fairchild Aircraft Corp., Hagerstown, Md., has contracted with Government for production of planes for War Department, with construction of new one-story plant, about 125,000 for parts manufacture and assembling; also for expansion in present plant, previously referred to. General contract has been let to Price Construction Co., Maryland Trust Building, Baltimore, for entire project. Cost close to $1,000,000 with equipment.

General Purchasing Officer, Panama Canal, Washington, asks bids until Dec. 23 for galvanized chain shackles, galvanized wrought iron or steel turnbuckles, stockless ship anchors, galvanized folding boat anchors, galvanized steel collar eye-bolts, galvanized steel ring bolts, boot hooks, brass boat cleats, etc. (Schedule 4618); until Dec. 26 for water meters (Schedule 4627).

Crown Cork & Seal Co., Eastern Avenue and Kresson Street, Baltimore, has let general contract to Consolidated Engineering Co., 20 East Franklin Street, for one-story addition, 100 x 250 ft., for storage and distribution. Cost over $75,000 with equipment.

The South

• **Food Machinery Corp.,** Florida Division, Monroe Street, Dunedin, Fla., machinery and equipment for canning and packing, plans one-story addition for production of new type amphibian tanks for Government. Cost about $200,000 with equipment. Main offices are at San Jose, Cal.

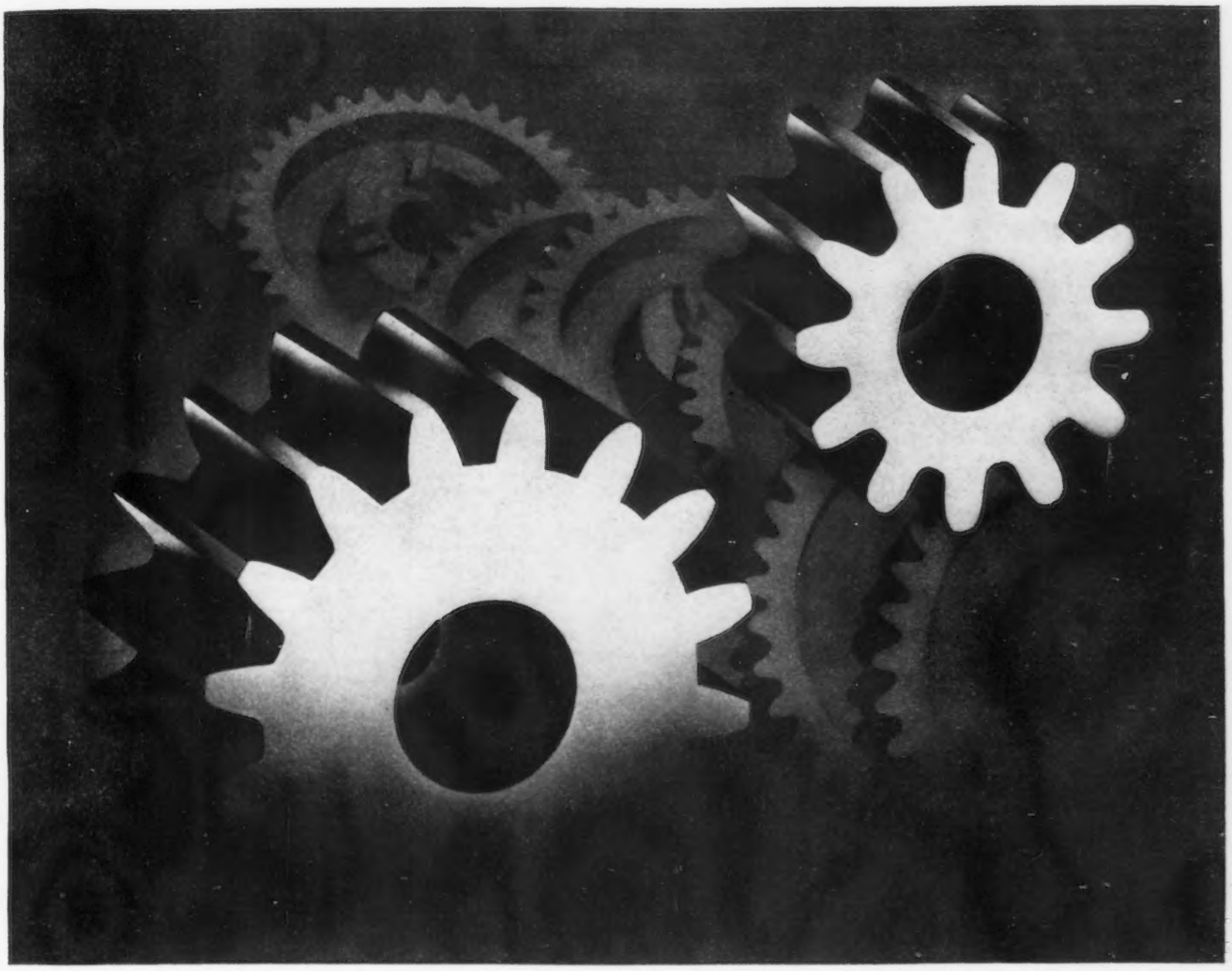
Celotex Corp., Marrero, La., near New Orleans, processed wall board products and kindred specialties, has asked bids on general contract for one-story addition to mill, 196 x 300 ft., for storage and distribution. Cost over $125,000 with mechanical-handling and other equipment. George H. Burt is company engineer. Main offices are at Chicago.

United States Engineer Office, Federal Building, Louisville, asks bids until Jan. 3 for two electric pumping plants, and power transmission line, at Harrisburg, Ill.

Louisiana Shipyards, Inc., New Orleans, care of N. O. Pedrick, president, Mississippi Shipping Co., New Orleans, recently organized with capital of $1,500,000, plans construction of local shipbuilding and repair works. Cost over $1,000,000 with equipment. C. A. D. Bayley, New Orleans, formerly head of a local shipyard, is vice-president.

Virginia Public Service Co., Alexandria, Va., plans expansion and improvements in local steam-electric generating station, including new 15,000-kw. turbine-generator unit, high-pressure boilers and auxiliary equipment. Cost close to $2,000,000. Award for turbine unit has been made to Westinghouse Electric & Mfg. Co., East Pittsburgh, and contracts for other equipment will be let soon.

Tennessee Valley Authority, Knoxville, Tenn., has engaged Stone & Webster Engineering Corp., Boston, to design and supervise erection of new plant at Muscle Shoals, Ala., for production of synthetic ammonia, used in manufacture of high explosives. Plant will occupy part of former No. 2 nitrate



GETTING THE JUMP ON MAINTENANCE

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works of Government and will consist of one and multi-story production units, with shops, power station and other structures. Fund of about $6,500,000 has been made available for project.

Quartermaster, Fourth Corps Area, Hurt Building, Atlanta, Ga., asks bids until Jan. 2 for new oil house for storage and distribution at Memphis Municipal Airport, Memphis, Tenn. (Circular 54-218).

Central States

• **Cincinnati Milling Machine Co.,** Cincinnati, has let contract to Austin Co., Cleveland, for one-story addition, 375 x 575 ft., for expansion in production department. Cost close to $500,000 with equipment.

Sheffield Gage Corp., 1517 East Third Street, Dayton, Ohio, plans one-story addition. Cost close to $180,000 with equipment. J. D. Lorenz, 330 West First Street, is architect.

Harshaw Chemical Co., 1945 East Ninety-seventh Street, Cleveland, plans one-story addition for expansion in plant on Harvard Avenue; also for extensions in branch plants at Elyria, Ohio, and at Swanson and Jackson Streets, Philadelphia. Entire project will cost about $850,000 with equipment. Financing is being arranged through sale of preferred stock.

National Advisory Committee for Aeronautics, Navy Building, Washington, will take bids on general contract for new aeronautical laboratory at municipal airport, Cleveland, consisting of steel hangar, cost about $200,000 with shop and reconditioning facilities; and engine torque stands, to cost close to like amount. These are initial units of project, to include main power house laboratory, cost about $3,950,000 with equipment; power plant wind tunnel and operating station, cost about $3,100,000; laboratory for instruments, fuels and lubricants, $550,000 with equipment, and other buildings. Entire project will cost close to $8,500,000. Rudolph F. Gagg, assistant chief engineer, Wright Aeronautical Corp., 132 Beckwith Avenue, Paterson, N. J., will supervise project for Government.

Goodyear Tire & Rubber Co., Akron, Ohio, has approved plans for six-story T-shaped addition, about 140,000 sq. ft. of floor space, part of structure for general production and remainder for storage, distribution and other service. Cost over $750,000 with equipment.

E. B. Lanman Co., 745 East 151st Street, East Chicago, Ind., bolts, nuts, washers, etc., plans two-story and basement addition, 50 x 60 ft. Cost close to $50,000 with equipment. William Wendland, 7855 South Stony Island Avenue, Chicago, is engineer.

Sterling Aluminum Products, Inc., 2825 North Market Street, St. Louis, automobile parts and allied equipment, has let general contract to John Hill Construction Co., Syndicate Trust Building, for one-story and basement addition, 80 x 112 ft. Cost close to $75,000 with equipment. Edward J. Lawler, 3736 West Pine Boulevard, is architect.

Union Electric Co. of Missouri, Inc., Twelfth and Locust Streets, St. Louis, has authorized plans for additions to steam-electric generating station at Venice, Ill., including two 40,000-kw. turbine-generator units, high-pressure boilers and auxiliary equipment. Cost about $7,500,000. Expansion will double capacity of new generating station now in course of construction at place noted, with estimated cost of $11,500,000, including transmission lines.

Deere & Co., Moline, Ill., agricultural implements and equipment, has let general contract to Texas Gulf Construction Co., 2008 South Wayside Drive, Houston, Tex., for new one-story factory branch, storage and distributing plant at Houston, to be occupied by its subsidiary, John Deere Plow Co., 2103 Walker Street, Houston. Cost close to $85,000 with equipment.

Texas Co., 720 San Jacinto Street, Houston, Tex., has asked bids on general contract for one-story mechanical and repair shop, 50 x 184 ft., with wing extension, 45 x 150 ft., and two service, repair and garage buildings for company trucks and cars, 20 x 165 ft., 25 x 75 ft., with wing extension, 20 x 33 ft. Cost over $100,000 with equipment. Austin Co., Second National Bank Building, is engineer.

Revere Copper & Brass, Inc., 5851 West Jefferson Street, Detroit, plans two-story addition, 120 x 150 ft. Cost close to $90,000 with equipment. Frederick Johnck and William Ehmann, 104 South Michigan Boulevard, Chicago, are architects.

Continental Aviation & Engineering Corp., 1260 Algonquin Avenue, Detroit, has let general contract to F. H. Martin Construction Co., 955 East Jefferson Street, for one-story addition, for airplane engine testing unit. Cost over $100,000 with equipment.

Redman Trailer Co., Alma, Mich., motor trailers and parts, has let general contract to Frank J. Kennett, Alma, for one-story addition. Cost close to $45,000 with equipment.

Atlas Foundry Co., 131 Livernois Street, Detroit, automobile castings, has let general contract to Harry T. Wunderlich, 2411 Fourteenth Street, for one-story addition. Cost over $45,000 with equipment. Maul & Lentz, David Whitney Building, are architects.

Dow Chemical Co., Midland, Mich., has let general contract to Austin Co., Cleveland, for two one-story additions to Dowmetal plant at Bay City, Mich., 83 x 340 ft., and 80 x 142 ft., respectively, for expansion in casting and other divisions. Cost close to $225,000 with equipment.

Ticsco Forging Die & Tool Co., 4417 West Rice Street, Chicago, has let general contract to Gustav Farstad, 4816 West Hutchinson Street, for one-story plant, 45 x 115 ft. Cost close to $50,000 with equipment. Sievert, Klefstad, 6317 North Hiawatha Avenue, is architect.

Ideal Commutator Dresser Co., Sycamore, Ill., motor maintenance equipment, electrical specialties, etc., has asked bids on general contract for one-story addition, 94 x 145 ft. Cost over $60,000 with equipment. Gilbert A. Johnson, Swedish-American Bank Building, Rockford, Ill., are architects.

Roth Mfg. Co., 1600 South Kilbourn Avenue, Chicago, automobile parts and equipment, has filed plans for one-story addition, 87 x 100 ft., for which general contract recently was let to Anderson & Windblad, 6235 South Michigan Avenue. Cost close to $50,000 with equipment. S. R. Ruby, 300 West Adams Street, is architect.

A. O. Smith Corp., 3533 North Twenty-seventh Street, Milwaukee, iron and steel products, has filed plans for one-story addition, 81 x 500 ft., to comprise continuation of a similarly large building now in course of erection. Cost over $250,000 with equipment.

Water and Light Commission, Kenyon, Minn., plans call for bids early in 1941 for diesel engine-generating unit and auxiliary equipment for municipal power station. Burlingame & Hitchcock, Sexton Building, Minneapolis, are consulting engineers.

Glenn L. Martin Co., Middle River, Baltimore, aircraft and parts, has contracted with Government for construction and operation on cost-plus-fixed-fee basis of new plant at Omaha, Neb., for assembling of military planes for War Department, parts to be produced in outside plants. It will comprise one-story units, with power house and auxiliary buildings, to cost over $7,500,000 with machinery. Financing will be provided by Government, which will hold title to plant.

City Council, Hawarden, Iowa, will take bids soon for extensions and improvements in municipal power plant, including new 1000-kw. generating unit and auxiliary equipment. Cost close to $95,000. Buell & Winter Engineering Co., Insurance Exchange Building, Sioux City, Iowa, is consulting engineer.

Allstate Plating Works, Inc., Chicago, organized to manufacture plated metal goods, has leased floor in building at 18 East Twenty-fourth Street, about 12,000 sq. ft., for plant. A. J. Domelle and F. Broughton are heads.

Western States

• **Chaffey Junior College and Union High School District,** Ontario, Cal., have approved plans for one-story aeronautics shop, 38 x 140 ft., at Chaffey Junior College. Cost over $60,000 with equipment. Harry L. Pierce, 1442 Mount Pleasant Street, Los Angeles, is architect.

H. Z. Heinz Corp., San Pablo and Ashby Avenues, Berkeley, Cal., food products, has let general contract to H. J. Christensen Co., and W. E. Lyons Construction Co., 2009 Pacific Avenue, for one, two and three-story addition. Cost close to $100,000 with equipment. Main offices are at Pittsburgh.

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for 300-kw. gasoline engine-driven electric alternator, gasoline storage tank, piping system, switchgear, panelboards and auxiliary equipment for Mare Island Navy Yard.

Boeing Aircraft Co., 7901 East Marginal Way, Seattle, airplanes and parts, has let general contract to Austin Co., Dexter-Horton Building, for addition to power house at plant No. 2. Cost over $50,000 with boiler unit and auxiliary equipment.

Consolidated Aircraft Corp., San Diego, Cal., plans new plant near present works, for production of flying boats and bomber planes for Government, comprising eight buildings, totaling over 1,550,000 sq. ft. of floor space, for parts production, assembling, testing and other service. Cost about $7,000,000 with machinery.

Gilfillan Brothers, Inc., 1815 Venice Boulevard, Los Angeles, field radios and parts, refrigerating equipment, etc., plans rebuilding part of plant recently destroyed by fire. Loss close to $450,000 with equipment.

General Engineering & Drydock Co., Schiller Street, Alameda, Cal., plans expansion and improvements in shipbuilding and repair plant, including additional shops and other structures. Cost over $175,000 with equipment.

Wells Aircraft Parts Co., City Terrace District, Los Angeles, organized to manufacture airplane parts and equipment, has taken out permit to build one-story machine shop, 95 x 150 ft., at 4140 Whiteside Avenue. Cost about $45,000 with equipment. William J. Moran, 1011 South Fremont Street, Alhambra, Cal., is engineer.

Canada

• **Shawinigan Chemicals, Ltd.,** 107 Craig Street West, Montreal, affiliated with Shawinigan Water & Power Co., same address, has approved plans for one-story addition to plant at Shawinigan Falls, Que. Cost close to $100,000 with equipment.

Pere Marquette Railway Co., General Motors Building, Detroit, plans one-story engine house with shop facilities at yard at St. Thomas, Ont., to include turntable and other handling equipment. Cost close to $65,000 with equipment.

Coca-Cola of Canada, Ltd., 90 Broadview Street, Toronto, Ont., plans new two-story and basement mechanical-bottling, storage and distributing plant, about 150 x 200 ft., at Vancouver, B. C. Cost close to $150,000 with equipment. A similar plant, to cost about same amount, is proposed in same district. Mathers & Haldenby, 96 Bloor Street West, Toronto, are architects.

Trade Notes

Wright Aeronautical Corp. has opened a Detroit office at 428 Boulevard Building, which will be devoted largely for the present to the purchase of jigs and fixtures and inspection of this equipment before shipment. The office is in charge of J. H. Schnur, formerly of Budd Mfg. Co. and Graham Paige Corp.

Sundstrand Machine Tool Co., Rockford, Ill., has moved into two additions to its plant which will increase production about 20 per cent. With orders on hand, the plant will continue capacity operations through 1941.

Innis, Speiden & Co., manufacturers and distributers of heavy chemicals, has recently been appointed as Ohio distributer of Drymet, Crystamet and Dryorth, powdered silicate products of the Cowles Detergent Co., Cleveland. The arrangement has been effective since Nov. 1, according to an announcement by Col. A. L. Mercer, president, and Mr. Earl F. Clark, heavy chemical department manager of Cowles.

This Week in The Iron Age

Editorial

Sub-Contracts 21

Technical Articles

Electropolishing 23
Tube Shaping 31
Heat Treating of Tool Steels 35
Throttling the Inventor 36
British and American Alloy Steels 40
Influence of Basis Metal on Plate 42
What's New in Welding Equipment 45

Feature Reports

On the Assembly Line 50
Washington News 54

News and Market Reports

News of Industry	60	Machine Tool Activity	90
Personals	78	Non-Ferrous Market	91
Obituaries	80	Scrap Market and Prices	92
Metal Working Activity	81	Construction Steel	94
Comparison of Prices	82	Iron and Steel Prices	96
Summary of the Week	83	Ferroalloys, Pig Iron Prices	101
The Industrial Pace	84	Warehouse Prices	102
District Market Reports	86	Sales Possibilities	103

Fatigue Cracks 58
Free Industrial Literature 61
Products Advertised 106
Index to Advertisers 132

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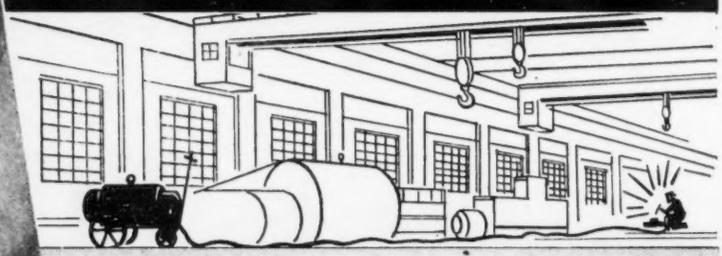

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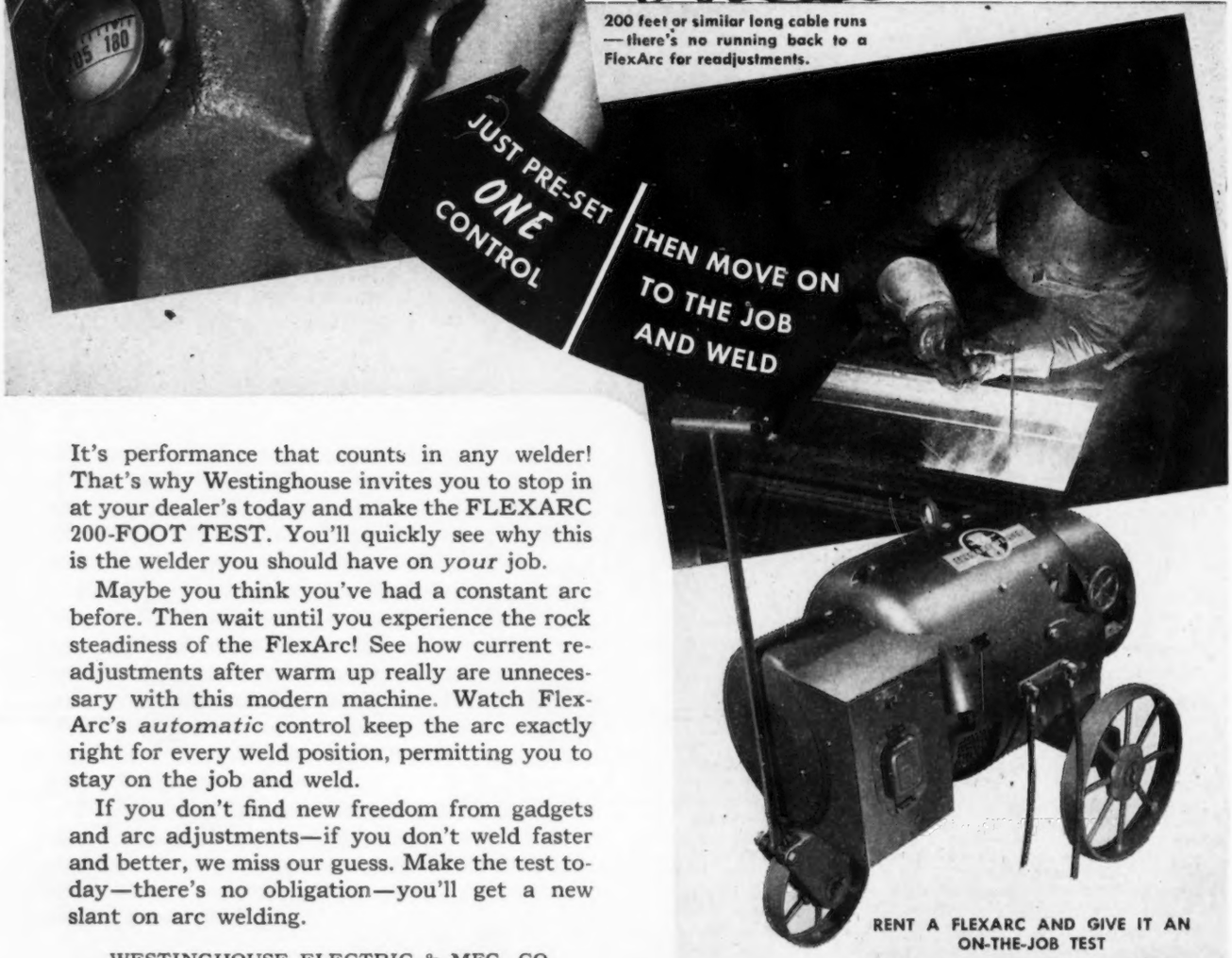

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The Iron Age

DEC. 26, 1940

ESTABLISHED 1855

Sub-Contracts . . .

THE pressure now is being applied to speed up our defense program. The slogan is, "seven days a week, 24 hours a day."

The idea back of this, of course, is to make use of every bit of production capacity that is available in the way of machine hours.

So those who now are engaged in work on the defense program must prepare to open the throttle all the rest of the way and let the machine roll at top speed.

But how about those not now engaged in defense work but who have capacity available for it? I refer to the smaller industrial plants of this country. The seven-days-per-week, 24-hours-a-day idea is of no use to them until they get their share of the business. And perhaps also, their share of the money that is being provided to finance intensive operations.

Great Britain has encountered this problem. In England today, there is a mandatory provision imposed on primary contractors that they shall sub-contract at least 40 per cent of the money value of the original contracts. And the responsibility for seeing these through falls upon them and not the Government.

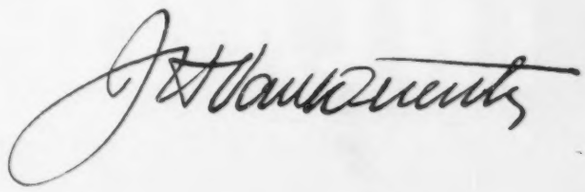
Let us hope that the passing along of defense work from primary contractors to our smaller plants will not have to be made mandatory here as it has been in England. But that objective will have to be accomplished if we are not to emerge from this defense effort with our large plants even larger and stronger and our small plants still smaller and weaker. And if that should happen it would mean the beginning of the end of our traditional American System under which the large comes from the small.

I do not think that our big companies want to see that happen, because it would be departing from the national path of successful growth through private initiative that all of them have followed. You can't get big elephants by mandate. You have to start with little ones.

Because I believe that our big companies do not want to see this happen, I hope that they will voluntarily do their utmost to preserve the economic position of their smaller neighbors.

I hope that every big plant in America that has a primary defense contract will "adopt" a number of smaller plants, for the "duration", that they will see to it that these smaller plants receive an adequate proportion of the total defense business. That they will provide these smaller plants with engineering and managerial advice whenever that is necessary. That they will aid them to replenish their labor supply by offering them a portion of the newly trained labor supply that comes through the training courses that only the large concerns are able to institute and conduct. That they will aid them whenever possible and necessary in obtaining credit and priorities for the installation of required new equipment.

That would be a real American way to go about making America strong.



Reading left to right are: Allen, Elaine, Mrs. Bollinger, Jean and Otto Bollinger, on a visit to the Inland Steel Diorama at the New York World's Fair.

Inland Family Chosen as Typical

Otto Bollinger and family were recently selected, in an extensive contest held at Chicago, as the typical Illinois family. Not only is the Bollinger family typical of Illinois, but it is typical of Inland families—Otto Bollinger is a machinist at the Inland mills.

There are thousands of family men at Inland, who, like Otto, use their ability and expert knowledge to help produce fine steel. They are steeped in the Inland tradition for unexcelled workmanship. Their primary interest lies in maintaining the high quality of Inland products.

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Electropolishing

—A Symposium on Today's Practice

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ELECTROPOLISHING, pickle, polishing, anodic luster, or what have you, have been terms very much on the tongues of metal men over the past year. But, whatever the terminology, the process is that of polishing metals by an electrochemical treatment rather than by cutting, tumbling, buffing or burnishing.

Such practice of polishing metals electrochemically in what is essentially a reversed electroplating set-up is not new (see THE IRON AGE, Jan. 11, 1940, for history), but in the past years has won distinct popularity with the metallographer as a quick and excellent means of polishing specimens for microscopic examination, and lately has branched out into the commercial finishing field, particularly as a means of finishing fabricated stainless steel articles difficult or impossible to handle on a conventional polishing wheel.

There has been less community of interest in the electropolishing of metallographic specimens and in the commercial finishing of fabricated metals than might be expected. Electrolytes used in the former are most frequently unsuited to large commercial installations, and the operating techniques in the two cases are only distantly related. Even more striking is the free exchange of information among the metallographers, whereas the commercial solutions are for the most part shrouded in mystery, evasion, and perhaps just a little deception; such a situation not being particularly surprising in view of the number of solutions going through the patent office and the possible future litigation visualized by some of the sponsors.

In an attempt to bring the entire subject of electropolishing up to date, the metals division of the A.I.M.E. conducted a symposium Oct. 23 at Cleveland. The idea of the symposium was commendable; the preliminary arrangements made by Sam Tour were excellent; for the metallographers the information developed at the symposium was most instructive but, the part of the symposium devoted to commercial electropolishing could only by a confirmed optimist be considered much of a success. Most of those companies controlling or sponsoring various commercial solutions either sent representatives who failed to appear at the symposium, or who came around to use their ears rather than their mouths.

Metallographic Specimens

As regards the electropolishing of metallographic specimens, Hugh E. Brown, of the W. S. Tyler Co., described the work done in his plant in preparing wire for examination, which wire is produced in many different tempers. Interest in this method of polishing first developed at the Tyler plant several years ago as the result of the work by Jacquet on tin. Now the Tyler company uses electropolishing as a continuous procedure and has limited mechanical polishing to only a rough polish before the electrolytic process.

Mr. Brown further pointed out that specimens could be electropolished following the use of a coarse file and some touching upon a Turkish emery wheel, contrary to the general opinion that a fine mechanical polishing as a preliminary is a requisite.

A number of colored slides were then shown of results obtained on various metals. Monel samples had been electropolished in 33 per cent nital solution and given a ferric chloride etch; grade A nickel used the same electrolyte and was etched with copper sulphate; 18-8 stainless steel likewise was electropolished in nital solution and etched in the same solution by reducing the current. This requires only a few minutes time, and if the etch is missed the current can be stepped up and the polishing started over again; cast beryllium copper used the same nital electropolishing solution, which also gives a very smooth surface to Munz Metal; 18-17 and 80-20 brasses are satisfactorily electropolished in nital solution and electrolytically etched in sodium thiosulphate solution; samples of 6 per cent tin phosphor bronze were shown which had been nital polished and given the usual ferric chloride etch; pure copper and silicon bronze were polished in orthophosphoric acid solu-

tion and electrolytically etched in sodium thiosulphate solution; and Hadfields manganese steel was shown polished in nital solution and etched in the same solution at lower current density.

Next, Fred Keller, of the Aluminum Co. of America, pointed out that his experience has been entirely with aluminum alloys, and the electrochemical procedure has been so employed for the past two years. It has been found advantageous in that relatively large areas can be polished, there is required a minimum of personal skill on the part of the operator preparing specimens, and the polished surface is relatively free of deformed metal. The disadvantages are that the various aluminum alloys and the different tempers require individual electropolishing techniques, and that the surface started with has to be quite smooth and accurate—preferably down to the semi-final polishing operation with No. 600 alundum flour.

Nonetheless, the electropolishing method for aluminum alloys was stated as giving a high quality metallographic finish, and when used for the final finishing operation for specimens it saves considerable time and gives superior results. Particularly for relatively pure metal and essentially solid solutions the electropolishing procedure is very valuable, as such types are difficult to handle by conventional means.

The solution used for electropolishing aluminum alloy specimens is the same as has for years been employed in the commercial electrolytic brightening of fabricated aluminum, i.e., the Alzak process, the solution being dilute fluoboric acid (HBF_4). This process is protected by patents owned by Aluminum Co. of America.

Next, it was pointed out by Dr. Frances H. Clark, of the Western Union Telegraph Co., that their procedure called for mechanical polishing through 000 emery, then electrolytic polishing the remainder of the way, and etching in the usual manner. If such a procedure is followed carefully, very good results are obtained. It was stated by Miss Clark that electropolishing of low carbon steel brought out the carbides very well and samples were shown to prove this point. The electropolishing method has also been extremely useful in the examination of cast copper for blow holes—the edges of such holes are not torn as they are when specimens are mechanically polished. Cold weather breaks in copper line wire may sometimes be attributed to the presence of an excess of cuprous oxide. The electropolishing method has been found to be the best possible procedure for disclosing these inclusions, and in fact the first use of electropolishing for such purpose showed much more cuprous oxide than had been anticipated.

Miss Clark also stated that the use of electropolishing might be developed to show the structure of metal samples produced by powder metallurgical methods. It is very often important to determine the amount of porosity in such sintered compacts and, if possible, the shape of the cavity. Ordinary polishing and etching methods tend to fill up the holes whereas electropolishing methods tend to accentuate the cavities too much. Slides of compressed and sintered copper samples of these two methods were shown. Further work needs to be done but it is hoped that electropolishing may become the most satisfactory means of studying powder metallurgical samples.

Miss Clark specified the use of acetic anhydride for steels and orthophosphoric acid for brasses and copper. The operating conditions were essentially those shown in the table in Metal Progress, October 1940.

The next speaker, J. R. Vilella of the United States Steel Corp. research laboratory, gave considerable detailed data on the electropolishing procedure used at Kearny.

For plain carbon and low alloy steels, Mr. Vilella pointed out that specimens intended primarily for examination of their microstructure can be polished electrolytically with a degree of perfection comparable to that obtained by competent mechanical polishing. Polished surfaces practically free from distortion of the surface metal, free from scratches and sufficiently flat and smooth for examination at all magnifications are obtainable. A variety of steels, ranging in carbon content from a trace to 1.80 per cent and made up of practically all the microstructures common to those steels, were polished satisfactorily.

Electrolytically polished surfaces exhibit certain defects, of which the most frequently met are: (a) an undulating, rather than a plane surface, (b) high relief of the carbide particles, particularly when they are coarse, as in spheroidized structures and (c) attack on the non-metallic inclusions. The undulating condition of the polished surface and the relief effect of the carbide particles, if kept to a minimum, do not interfere seriously with the proper development of the structure by etching, or with its microscopic examination, but the attack on the non-metallic inclusions is excessive, particularly in the low carbon steels, and makes the metal appear considerably "dirtier" than it actually is. In this respect the electrolytic method yields results inferior to competent mechanical polishing, according to Mr. Vilella.

No time or effort is saved during the grinding part of the polishing process because to obtain optimum results by the electrolytic method the specimen must be ground to the same fineness as for mechanical polishing. In general, the finer the grinding, the shorter the time needed to produce a satisfactory polish, the less the waviness and relief effect and the less the attack on the non-metallic inclusions. Time can be saved in imparting the final polish when, (a) the specimens are unusually large, (b) when an excessive amount of disturbed metal is produced during the grinding part of the process and (c) when the operator is unskilled at mechanical polishing. In mechanical polishing, the length of time required to impart the final polish increases rapidly with the size of the specimen, but in electropolishing size makes no difference, provided that the necessary current density can be obtained.

In mechanical polishing it is often necessary to repolish, re-etch and examine the structure microscopically several times in order to be certain that all traces of disturbed metal have been eliminated; this often consumes considerable time. In electrolytic polishing, on the other hand, it is often possible to dissolve all disturbed metal by one treatment. The time required to finish a specimen correctly by mechanical means depends to a great extent on the skill of the operator, but in electropolishing the skill of the operator is a less important time-saving factor, since he only has to calculate the current needed to produce the required current density, adjust the circuit and agitate the electrolyte while the specimen is in it. The time generally consumed after the specimen has been ground to the required fineness is approximately 10 min. A skillful operator can finish a specimen of average size mechanically in shorter time.

The electrolyte (a solution of perchloric acid and acetic anhydride) is violently explosive and must, therefore, be handled with extreme care at all times. Contamination with alcohol and other organic substances is particularly to be avoided.

Specimens mounted in bakelite cannot be electropolished because the electrolyte attacks the bakelite and causes

severe staining. In view of the reported explosiveness of the solution it is prudent not to attempt the electropolishing of specimens mounted in any organic molding material. The copper strips often used to separate specimens mounted in steel clamps also cause staining, but specimens mounted in steel clamps without the aid of copper strips can be electropolished using a current calculated on the sum of the area of each specimen plus that of the clamp.

STAINLESS STEEL: Ferritic and austentic alloys can be polished electrolytically with a degree of perfection that is difficult to attain by mechanical means. For this purpose the electrolytic method appears to be a decided improvement over mechanical polishing and its adoption for the preparation of stainless specimens was strongly recommended by Mr. Vilella. It constitutes an effective means of eliminating the film of distorted metal produced by grinding, but it tends to leave the non-metallic inclusions in relief, thus exaggerating their size and imparting to the steel an unwarranted "dirty" appearance. This condition can be corrected to a considerable extent by repolishing mechanically.

Complete elimination of all traces of disturbed metal is seldom effected by one electrolytic attack of 5 min. duration; specimens which have been ground on emery or carborundum papers generally require two or three repolishings (electrolytic) and reetching for total elimination of all traces of disturbed surface metal.

DESCRIPTION OF METHOD: The wiring diagram for the electrolytic polishing apparatus, as given by Mr. Vilella, is shown herein as Fig. 1.

The electrolyte for polishing plain carbon and low alloy steels is prepared as follows: Place a beaker containing 185 c.c. of perchloric acid (sp. gr. 1.61) inside of a larger receptacle containing cracked ice or through which cold water is circulating, and add *gradually* 765 c.c. of pure acetic anhydride and then 50 c.c. of distilled water. Allow the solution to rest undisturbed for at least 24 hr. before using. The solution for polishing stainless steel is similarly prepared but contains 335 c.c. of perchloric acid, 665 c.c. of acetic anhydride and no water. According to the originators of this method it is advantageous to dissolve 0.5 per cent of aluminum, by anodic attack, in the solution for plain carbon steels. This increases the viscosity of the electrolyte, permitting more vigorous agitation and the use of a smaller current density. Neither electrolyte appears to deteriorate on standing, but both lose potency with use. When it is observed that they are becoming weaker, their original efficiency can be restored by the addition of 1 per cent by volume of water.

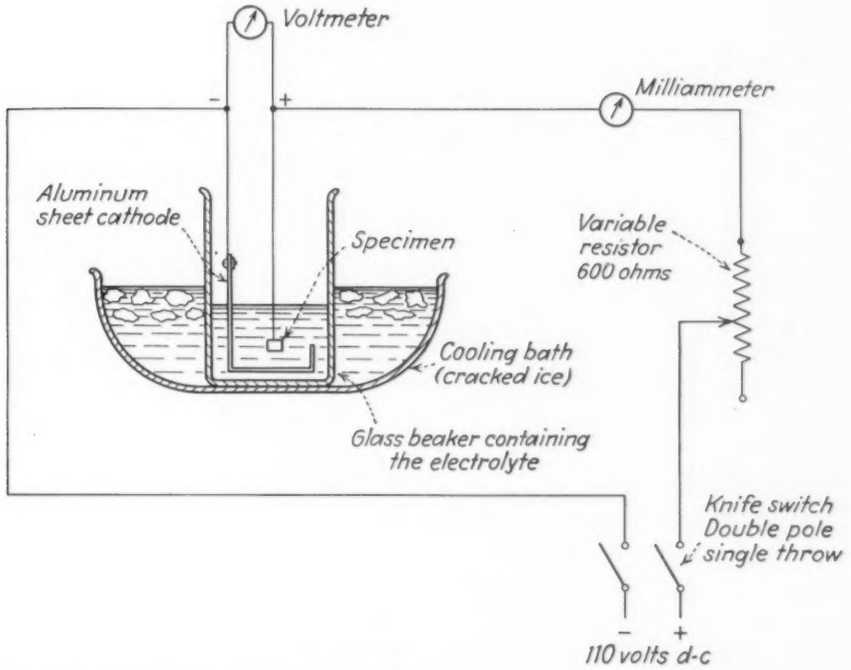

FIG. 1—Wiring diagram for electrolytic polishing, as used by the United States Steel Corp. research laboratories.

The specimen to be polished constitutes the anode of the cell. It should be free from all traces of grease or oil, and preferably, any scale present should be ground off before it is placed in the electrolyte.

The cathode can be a sheet of either aluminum, low carbon steel, or stainless steel. No effect on the quality of the final polish was observed when the area of the cathode was varied between 10 and 30 times that of the specimen. Likewise, its position with respect to the specimen, whether above, below or to one side, does not seem to influence the final result. A distance of ¾ to 1 in. between specimen and cathode was found satisfactory.

Proper adjustment of the current density is the factor which, more than any other, is likely to affect the quality of the results, according to Mr. Vilella. For plain carbon and low alloy steels a current density of 5 amp. per sq. dm. (approximately 0.3 amp. per sq. in.) yields the best results. If the current density is too low the specimen is etched deeply and the grinding scratches are not removed; if too high, pitting takes place. For stainless steel a minimum current density of 7 amp. per sq. dm. (approximately 0.45 amp. per sq. in.) should be used. These alloys do not require as careful regulation of the current density as the plain carbon steels, but nothing is gained by using higher current densities. In calculating the current, the *total* area of the specimen must be considered since the entire specimen is immersed in the electrolyte and will be acted upon. In calculating the current for specimens made up of thin sheets assembled as a single specimen in a clamp, the area of each individual sheet must be considered in addition to that of the clamp, for it seems that no matter how closely packed they are, the electrolytic penetrates between them.

Using the current densities recommended, the time required to obtain a satisfactory polish decreases with the fineness of the grinding scratches present on the specimen. In plain carbon and low alloy steels the scratches produced by 500 mesh grit or 000 emery papers can be removed in approximately 5 min. Stainless steels similarly ground can be electropolished free from scratches in 4 min., but an attack of this duration is seldom sufficient to remove all traces of disturbed metal. Several similar attacks are often needed to accomplish the desired results.

The waviness of the finished surface observed frequently in electropolished specimens can be minimized greatly

by constantly agitating the electrolyte. This may be done either by moving the specimen, stirring the solution with a rod or other convenient means or by bubbling air through the solution.

The sequence of steps involved in electropolishing is as follows: The specimen is ground down to a grit of 500 mesh or finer, the scale on the sides ground off and all traces of grease removed. Its area is then measured and the current needed to produce the required density calculated. It is then connected to the positive wire and inserted in the electrolyte, which must be agitated and not permitted to rise in temperature above 85 deg. F. (30 deg. C.) at any time. As the sample is placed in the electrolyte the current is adjusted to the calculated density by means of the sliding resistance. During the first 20 sec. the current tends to fall and the voltage to rise, this change coinciding with the formation of a reddish-brown deposit on the specimen. While this is taking place the current is adjusted to maintain the calculated density. For the remainder of the attack the current remains constant. When the attack has been completed the specimen is washed free of any deposit and dried; it is then ready for etching.

Mr. Vilella went on to state that: (1) in structures made up of coarser carbide particles the difference in level between the carbide particles and the ferrite matrix frequently exceeds the depth of focus of intermediate and high power objectives and thus interferes seriously with microscopic examination and photomicrography; (2) specimens whose structures were martensite, tempered martensite and bainite can be polished electrolytically with results comparable to those obtained by mechanical polishing—the technique was also found applicable to case carburized specimens; (3) it is possible to polish satisfactorily a wide range of plain carbon and low alloy steels using the same current density; (4) permanent installation of equipment for electropolishing is unhesitatingly recommended for laboratories where much metallography is carried out on these stainless alloys; (5) stainless alloys whose structure consists of austenite and ferrite, such as 18 Cr, 8 Ni, and 2.5 Mo, and those in which the nickel has been replaced by manganese, may be polished satisfactorily using the procedure recommended for the ordinary 18Cr-8 Ni alloys.

Portable Tester

What appears to be a most valuable innovation in the field of inspection was the device described by H. W. Russell of Battelle Memorial Institute. It was pointed out that heretofore the first knowledge of the sensitivity of fabricated stainless steel articles to intergranular corrosion was the failure of the article. And, what has been needed has been a simple, non-destructive procedure for testing stainless steel for intergranular corrosion sensitivity, using a definite and reproducible technique.

The conventional Strauss test can be used on small samples, of course, but the Battelle technique announced by Mr. Russell can be used on fabricated articles, large or small, and even on rough castings.

The equipment used is a small round open-end lead cell, equipped with a short length of rubber tubing on one end. This is pressed against a fabricated article, the rubber giving a seal and enclosing a definite test area. About 2 to 3 c.c. of solution is used for each test, the solution being discarded after each test. The solution is 60 per cent sulfuric acid to which is added 5 c.c. per liter of Glycyrrhiza Extract (Licorice). The current density is 2000 amp. per sq. ft. which for a test spot 3/8 in. in diameter requires only 1.5 amperes at between 5 and 6½ volts. The time of treatment is 3 min.

When a fabricated article is so tested and the test spot fails to polish, it indicates the steel is susceptible to intergranular corrosion. The frostiness results from failure to polish carbides, and is visible to the naked eye. Stainless steels free from precipitated carbides are polished to a mirrorlike surface. For the testing of stainless steel castings, a small section is first ground and then mechanically polished with emery cloth and finished with No. 1 grit emery polishing paper. There is no need to remove all scratches. The portable tester is then placed on the spot and the electrochemical test carried out in the manner already described, the polishing or lack of polishing of the test area being interpreted as non-susceptibility or susceptibility respectively for intergranular corrosion.

Mr. Russell emphasized the point that as an electropolishing process the procedure represents a borderline condition deriving its peculiar interest from its failure to polish stainless steel susceptible to intergranular corrosion, and hence providing a test for this condition.

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FIG. 2 — High-purity iron, etched with 1 per cent nital and at 250 diameters.

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The next speaker, S. J. Rosenberg, of the National Bureau of Standards, stated first that although electrolytic polishing is not a routine method of preparing metals for microexamination at the National Bureau of Standards, it has been used to advantage in certain cases. The technique used at the Bureau was devised by T. D. Brown, H. C. Vacher and J. A. Bennett.

For polishing high-purity iron, samples are mounted in bakelite and polished through 3-0 paper. They are next polished dry on satin, using 600-mesh alundum on the reverse side of the cloth. The next and final step is the electrolytic polish.

The electrolyte used is a solution of 55 per cent orthophosphoric acid in water, and it has been found important to adjust the solution to a specific gravity of 1.316 for optimum results. Electrolytic iron is used as the cathode.

Current is taken from a 110 volt line using a 100 watt bulb as a resistance in the cell circuit. The voltage is adjusted to about 0.5 volt for a specimen having a surface area of 0.3 sq. cm. Satisfactory results are obtained with a current of about 10-12 milliamperes over this surface area. Control of the current has been found to be very important, decreased current causing the specimen either to etch or polish in relief.

A micrograph of a sample of high-purity iron polished in this manner was shown by Mr. Rosenberg, and is reproduced herein in Fig. 2.

For polishing copper, the technique used is quite similar to that used with iron. Mechanical polishing is carried through either 3-0 paper or to wet laps with 600-mesh alundum. The specimen is then given a preliminary electrolytic polish for about 10 min., followed by a polish with alumina on broadcloth for about 5 min. This, in turn, is followed by the final electrolytic polish. For a very good surface it has been found advantageous to polish about 10 min. with magnesia after the final electrolytic polish and before etching.

The electrolyte used is 55 per cent orthophosphoric acid in water. According to Mr. Rosenberg, it is necessary that the electrolyte be kept fresh to avoid pitting. After the electrolyte had been used it can be purified by substituting a platinum anode for the specimen and continuing the electrolysis until the solution is colorless. Copper gauze is used as the cathode. The source of current may be two pairs of dry cells adjusted, by means of a slide-wire resistance, to about 1.95 volts.

A micrograph of a sample of a single crystal of copper, rolled from a thickness of 1 to 0.1 in., was shown by Mr. Rosenberg and is reproduced herein in Fig. 3.

The polishing plane was perpendicular to the direction of rolling. X-ray diffraction patterns from areas of the rolling surfaces showed that the slanting parallel lines shown in the micrograph were the traces of the octohedral planes which are the slip planes in a copper crystal.

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FIG. 3 — Cold rolled coppermonycrystalline polished surface is perpendicular to the direction of rolling. Rolled from 1 in. to 0.1 in. diameter. Etched with 10 per cent ammonium persulphate; at 37 diameters.

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For polishing Monel metal, the same set-up as for high-purity iron is used. The electrolyte is a mixture of 1 part concentrated nitric acid and 2 parts absolute methyl alcohol. Caution must be exercised in mixing. The acid should be added to the alcohol very slowly and the mixture must be kept cool. Stainless steel (18-8) is used as a cathode. Voltage is adjusted to 2.4-2.6 volts. A current density of 125 to 150 milliamperes per sq. cm. has been found to be most suitable. Below this range deep etching occurred; above it, pitting. Time of polishing is from 7 to 10 min.

A micrograph of a sample of Monel metal, polished electrolytically, was shown by Mr. Rosenberg. This is reproduced herein as Fig. 4.

In electrolytic polishing, it is frequently necessary to maintain the distance between anode and cathode within rather close limits, according to Mr. Rosenberg. It is also necessary, after polishing has been completed, to remove the specimen from contact with the electrolyte as quickly as possible. To effect this, a simple cell for electrolytic polishing has been designed at the Bureau (shown herein as Fig. 5). The cell itself is of glass tubing, sealed at both ends to disks of bakelite with cementyte. The cathode may be of any desired material, formed either into a cylinder or disk of about 1½ in. diameter. The specimen, mounted in bakelite, fits into a recess in one of the bakelite disks and is held in place by steel springs not shown in the sketch. In use the cell is inverted, the electrolyte is poured in, the specimen put in place and the voltage is applied. The cell is then inverted so that current starts to flow as soon as the electrolyte comes into contact with the specimen. After polishing has been completed the specimen can be quickly removed from the electrolyte by again inverting the cell.

The next speaker, E. E. Schumaker, of the Bell Telephone Laboratories, briefly reviewed his work with electrochemical polishing, and stated that results obtained so far were in fair agreement with published methods. Mr. Schumaker was followed by G. E. Pellissier, of the Carnegie Institute of Technology, who showed a number of striking photomicrographs, all of structures which would have been difficult to define by normal mechanical polishing. Mr. Pellissier stated that electropolishing was most satisfactory for steels with carbon contents ranging from 0.10 to 1.4, and for low alloy steels. It has also been used with great success for pure iron and for stainless alloys. Fair success also has been obtained in the polishing of steels for the examination of inclusions and quenching cracks. It was emphasized that the most critical factor in electropolishing is current density, and it is most important to carefully calculate the size of the specimen, and to include in this calculation the area of connecting wires, etc.

Also, Mr. Pellissier went on to say that if the metal of the specimen clamp or holder is very much unlike that of the specimen as regards its electrochemical properties, erratic results are obtained; in some cases the clamp may even be polished preferentially. So far it has proved difficult to design a satisfactory and convenient specimen holder for use in the perchloric acid-acetic anhydride electrolyte. Furthermore, difficulty is experienced in washing the specimens rapidly enough, after removal from the electrolyte, to prevent objectionable etching. The cell described by S. J. Rosenberg, which was devised to minimize this effect, obviously cannot be used with perchloric acid and seems

rather ineffective since a film of electrolyte must still remain on the specimen surface after inversion of the cell.

And, according to Mr. Pellissier, there appears to be some disagreement regarding the effect of electropolishing on non-metallic inclusions. According to Mr. Vilella one of the defects of the method is the attack on the non-metallic inclusions, but Mr. Pellissier found no evidence of attack on the following types of inclusions: iron and manganese sulphides, zirconium and titanium nitrides, and alumina. These inclusions tend to stand in relief on prolonged electropolishing, but by using worn 000 emery paper containing graphite as the final grinding stage the time of subsequent electropolishing may be minimized (i.e., amount of metal removed is small) so that the relief is not serious. Evidently silicate-type inclusions are attacked during electropolishing.

In conclusion, it was stated by Mr. Pellissier that the explosiveness of perchloric acid has received much attention in discussions of electropolishing. However, its instability should not prohibit its use if a reasonable amount of care and judgment is exercised. Perchloric acid is an important routine analytical chemical reagent. Its properties and uses have been discussed by G. F. Smith in a pamphlet entitled "Perchloric Acid" (Vol. I, 4th Edition, March, 1940) published by the G. F. Smith Chemical Co., Columbus, Ohio.

Work done at the International Nickel Co. was then described by R. Vines of the research laboratories. It was stated that a number of solutions for electropolishing nickel and nickel content alloys for metallographic work had been studied. The successful solutions could be divided into two main types: the alcohol-nitric acid solution developed by Dr. Brown of W. S. Tyler Co., and the perchloric acid solutions developed by Jacquet.

The solution compounded from two volumes of absolute methyl alcohol and one volume of concentrated nitric acid works well on nickel and Inconel and is especially good for Monel. The current density used is quite high (5 to 10 amp. per sq. in.) and some provision for cooling the solution must be made when a number of specimens are to be polished successively.

Because the optimum current density appears to vary with the size and shape of the specimen, and since the polishing time is very short (5 to 20 sec.), a trial and error method of determining the optimum current density is used for each specimen. In doing this, the specimen is polished on the low side of the expected optimum current density where etching occurs and a matte surface is produced. Gradually, the current is raised to a point just above that where the last trace of matte surface is removed. In this way a relatively smooth polished surface is obtained. Typical results obtained with this solution on Monel, aged "K" Monel and Inconel were shown.

According to Mr. Vines, stainless steel may be electropolished in a solution of two volumes of glacial acetic acid and one volume of perchloric acid. This solution also gives quite good results on nickel and various nickel alloys. High current densities are required and polishing times from one to five min. are suitable with this solution. Typical results on nickel, stainless steel and 30 per cent cupronickel were shown.

For steel and iron, P. Jacquet's acetic anhydride-perchloric acid solution was found eminently satisfactory.

Summarizing, Mr. Vines stated that in its present state of development, electropolishing has certain limitations which prevent it from supplanting completely the orthodox methods.

He listed its advantages as:

(1) Prevention of flow with consequent better definition.

(2) Speed of polishing.

(3) Mounting can be omitted in many cases.

(4) As-rolled or curved surfaces, if initially not too rough, can be polished.

Its disadvantages were given as:

(1) Inclusions are for the most part removed.

(2) The surface is not suitable for low magnification and pitting sometimes occurs.

(3) In addition to the slight waviness of the surface, at times certain grains or twins stand in relief.

(4) The solutions are quite corrosive and disagreeable.

Commercial Electropolishing

Following the reports on progress in electropolishing metallographic specimens, the attention of the symposium was directed to progress made in using electropolishing as a commercial finishing operation for fabricated metal articles. At this point the pace of the symposium slowed drastically, and the only contributions came from I. C. Clingan, of the Rustless Iron & Steel Corp., and Sam Tour, of Lucius Pitkin, Inc.

Mr. Clingan stated that it had been the good fortune of the Rustless company to have been active workers in securing a start for electrolytic polishing in industry. Not a great deal was known about it outside of the laboratories. Its problems were new and frequently difficult.

Primarily, the process is a finishing method and must measure up to finishing standards, said Mr. Clingan. An electrolytic finishing method for fabricated stainless steels has various functions to perform. First of all it is expected to clean, i.e., it must be capable of removing light grease and oils. It would be much better to remove these compounds before subjecting the specimens to polishing, but

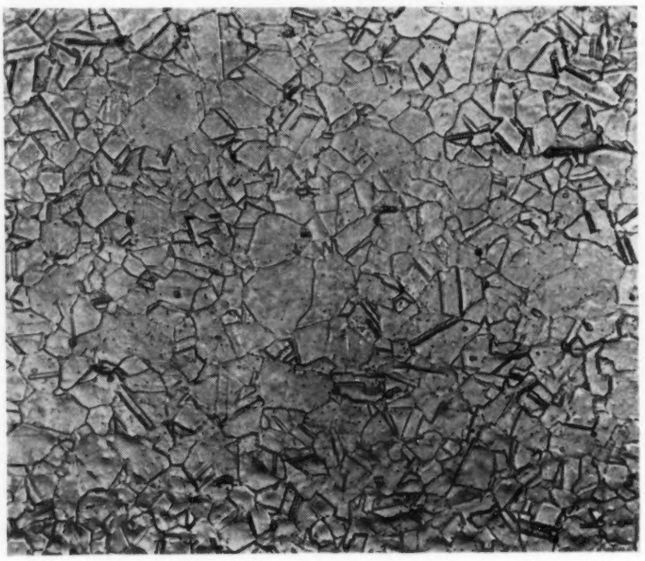


FIG. 4 — Monel metal. Etched with equal parts of acetic and nitric acids; at 250 diameters.

this entails a separate operation and is usually considered an unnecessary expense. A large part of the business of fabricating stainless steels involves the use of electric spot welding. This operation leaves around the welded metal an oxide scale of varying thickness. As the depth of this oxide scale diminishes, a point is reached where the thickness of the oxidized layer will become comparable to the wave of light, and over this region the thin films give rise to a series of interference tints, commonly known as temper colors. It is the function of the finishing method to remove both the scale and temper colors. It should be effective in removing small metal burrs produced by the cutting machines. Finally, it should impart to the metal surface a highly polished, uniform finish, without too great a metal loss.

A number of anions have been utilized in the electrolytic polishing of metals. However, conditions of temperature, current density, acid concentrations, and even safety, have narrowed the number found to be suitable for industrial use, according to Mr. Clingan. The sulphate ion and the phosphate ion are used directly in practically all of the electrolytes being employed for polishing purposes. Quite often these ions are used in conjunction with non-electrolytes or very weak electrolytes, such as the organic compound.

A suitable polishing electrolyte should not be affected in its polishing properties through contamination with dirt, grease, oils, or like foreign substances. The use of clean specimens is to be encouraged, but Rustless has yet to find them in actual practice. The electrolyte should perform its polishing functions within a reasonably short period of time and without the loss of too much metal. The treatment time will of course depend to a great extent upon the surface condition of the metal and upon the current density employed. It is possible to smooth out rough surfaces to some extent but this definitely has its limitations.

From the viewpoint of economy, both in original cost and maintenance of equipment, such as work racks, an electrolyte that permits the use of reasonably low current densities seems the most desirable. For example, a low current density permits the use of a motor-generator set of correspondingly low capacity and simplifies the problem of anode contact.

The use of suitable temperatures has been found to be of the utmost importance in determining the reflectivity and depth of the polish obtained. It is therefore desirable that the temperature range be not too critical. Control of bath temperature is affected by existing atmospheric conditions as well as by internally generated heat.

The applied voltage required to obtain the necessary current density for polishing in a newly prepared bath ought not to change materially as the bath becomes laden with metal salts. Experience has shown that when the voltage has to be considerably increased, due to the building up of metal salts in the electrolyte, it has a material effect upon the luster and reflectivity of the polish obtained. This condition will only occur where the metal salts have a high solubility in the electrolyte.

The electrolyte should be adaptable to the polishing of all types of stainless steels; have long life; be quickly and readily removed by rinsing; and should not evolve obnoxious fumes or be in any manner injurious to the health or safety of the operator.

In the application of mixtures of citric and sulphuric acid as the polishing medium, Rustless has found that this electrolyte measures up in a large degree to the requirements mentioned. It is easily controlled and may be kept at the peak of its effectiveness by workers who know nothing of its chemistry. While analysis of the solution is advisable, it is not necessary and is seldom practiced.

Mr. Clingan was unable to state what the life of this electrolyte is but judging on the basis of past performance it is indefinitely long. Some of these solutions have been in active use for two years and have only received additions to take care of drag-out loss, and loss through the removal of metal sulphates. These metal sulphates precipitate out in the form of a sludge and are removed from time to time by dipping. It is due to the formation of this sludge that the life of the solution is prolonged. Ferrous sulphate, for instance, has a low solubility in strong sulphuric acid solutions. The presence of citric acid does not tend to increase its solubility to any great extent. Hence, the concentration of metal salts in the electrolyte at any one time is never very great. This behavior of the metal sulphates also has an important bearing on the required voltage as explained previously.

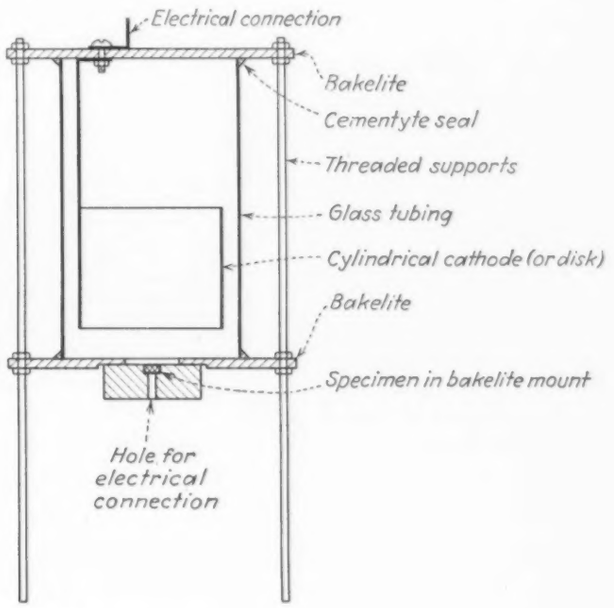


FIG. 5 — Cell used at Bureau of Standards to permit quick removal of specimens from the electrolyte.

Comments by Tour

Concluding the symposium, Sam Tour pointed out that electrolytes suitable for the electropolishing of metallographic specimens may not be suitable for a commercial finishing operation for fabricated metal articles made of the same material as the metallographic specimen. Electrolytes of the perchloric acid, acetic anhydride type are entirely too dangerous for consideration in commercial application to fabricated articles. Electrolytes of the methyl alcohol nitric acid type are too hazardous for consideration, and electrolytes which rapidly attack the metal to be electropolished even without the application of current are unsuitable, according to Mr. Tour. In metallographic specimens, it is possible to remove the specimen from the solution and rapidly wash it in the course of a fraction of a second or a second. In commercial work, it is not possible to

remove a large fabricated article from an electropolishing solution with this speed. In the metallographic work, it is possible to use high voltages and high current density. These are not practical for commercial application.

In spite of these added difficulties, the application of electropolishing methods to fabricated metal articles has proceeded quite far.

At the National Metal Congress in Cleveland in 1936, Mr. Tour stated that he showed numerous representatives of the stainless steel producers how it was possible to electropolish 18-8 stainless steel in commercial sizes. Numerous specimens were shown. However, great skepticism was encountered. The old thought that pickling meant the production of dull surfaces and that the more the pickle the duller the surface was still firm in everyone's mind. Some of the samples shown in 1936 together with other samples were exhibited in the Metal Products Exhibit space in Rockefeller Center in New York City in 1937. Many expressed mild surprise and again were skeptical that commercial electropolishing was feasible, according to Mr. Tour.

The initial samples shown publicly in 1936 were produced in a bath consisting of sulphuric acid plus a small amount of hydrofluoric acid. This bath produced lustrous finishes on the 18-8 variety of stainless steels. (Patent No. 2,115,005.) It was pointed out by Mr. Tour that this bath has been found suitable also for a certain amount of electropolishing of aluminum and some aluminum alloys. One modification of the bath is particularly good for descaling of stainless steel and for the production of controlled finishes of various degrees of lustre. In this fashion, it is possible to produce artistic designs in various shades of lustre or degrees of frost on stainless steel. Samples of this type were exhibited in 1936 and 1937.

From a commercial standpoint, the primary objection to the sulphuric-hydrofluoric bath is the hydrofluoric acid fumes which rise from the bath in operation. Although this is not worse than that coming from any hydrofluoric acid pickle, it is objectionable. Obviously, this fume is not as objectionable as the hazard of perchloric acid or the fumes from and the hazard of nitric acid and alcohol mixtures.

Electropolishing solutions of phosphoric and sulphuric acids have been developed which overcome the difficulties of the fume problem. The acids are available in commercial grades and are not overly expensive. The installations require lead-lined tanks as are used in numerous electroplating installations. The electrolyte must be maintained within a suitable temperature range which is not overly critical and is readily maintained by the use of heating and cooling coils in the lead-lined tank. Voltages required are of the order of 6 to 15 volts as is used in chromium plating. The throwing power is good, although deep recesses must be reached with special shaped cathodes.

Mr. Tour then pointed out that Mr. Clingan had expressed the fond hope that the electrolyte should be adaptable to the polishing of all types of stainless steel. Dr. H. W. Russell of Battelle Memorial Institute has shown that 18-8 steel in a condition to be sensitive to intergranular corrosion does not polish as well as the same steel in the proper condition to resist intergranular corrosion. With this wide variation in the way 18-8 steel reacts to one electropolishing solution, it would be surprising indeed if some other electropolishing solution would be equally suitable not only for 18-8 in all conditions but for other types of stainless steel. It would be ideal in the electroplating field if there was one electrolyte from which any of the metals could be electroplated. No such electrolyte seems possible. Various mixtures of phosphoric and sulphuric acids, the ratio of these acids, the temperature and current density used being varied to suit the particular kind of stainless steel to be treated seem the nearest to the ideal which has been produced to date. By varying the conditions, it has been possible to produce satisfactory commercial electropolished finishes on practically all of the grades of stainless steel. With still further modification of the base solution and the use of proper addition agents, it has been possible to electropolish plain carbon steel. Similarly, solutions consisting mainly of phosphoric and sulphuric acids, with some additions, have been developed for the commercial electropolishing of nickel, monel metal, Inconel, Nichrome and other high nickel alloys. Similarly, proper solutions have been developed for aluminum and some of the aluminum alloys.

In general, the sulphuric and hydrofluoric acid mixes and the sulphuric and phosphoric acid mixes are referred to as the Blaut-Lang processes covered by the patent previously referred to and further patents pending. These processes are being licensed to various concerns for commercial operation and have proven their commercial success in a number of installations.

There seems to be a possibility that plain carbon steel articles may be electropolished as a preliminary treatment for electroplating, according to Mr. Tour. With this development it should become possible to rack the articles, electropolish them, rinse them and place them in the electroplating solution directly without any reracking or intermediate mechanical polishing and cleaning operation. Where multiple coats are to be applied, it may be possible to electropolish the intermediate electroplate. As applied to copper, nickel and chromium plating, this would then mean carrying the work through with one rack from the initial stack to the finished article and eliminate the multiple polishing operations necessary in present production. This is purely a thought as to future possibilities and is not stated as having been fully developed at this time.

Another possibility is the development of barrel methods of electropolishing.

The phosphoric-sulphuric acid solutions used for electropolishing of stainless steel, plain carbon steel, nickel and nickel alloys and aluminum and aluminum alloys are simple to make, easy to control and operate, and of long life. Electropolishing cannot take the place of good material to be polished. If the steel contains slag stringers, dirt spots, rolled-in scale, etc., the presence of these foreign bodies in the steel will be accentuated by electropolishing, according to Mr. Tour. Electropolishing requires a good grade of basic material upon which to work.

Tube Shaping

Dewey Process Controls Wall Thickness

By DON JAMES
Cleveland Editor, The Iron Age

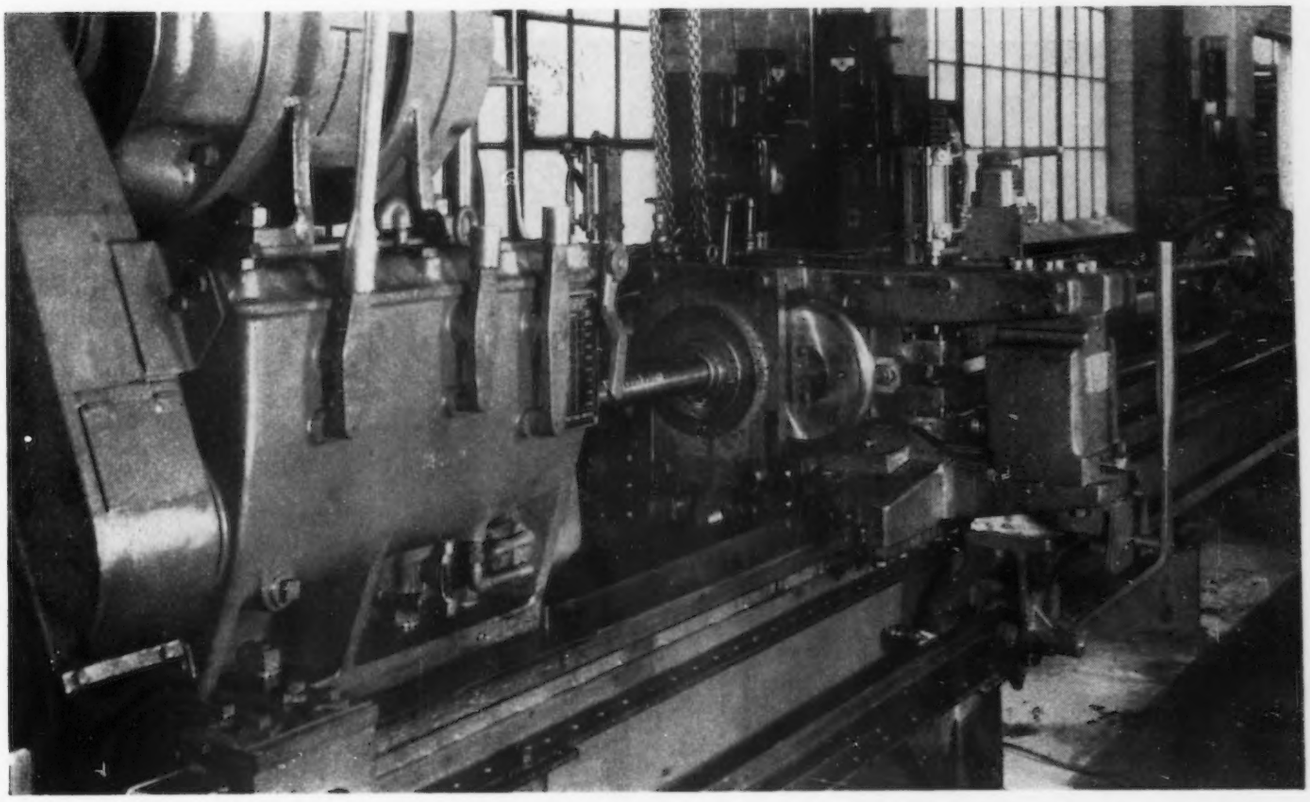
OFFERING numerous advantages the new Dewey process for tapering or curve-shaping metal tubes has aroused considerable interest since it was developed at the Cleveland plant of Steel and Tubes Division of Republic Steel Corp.

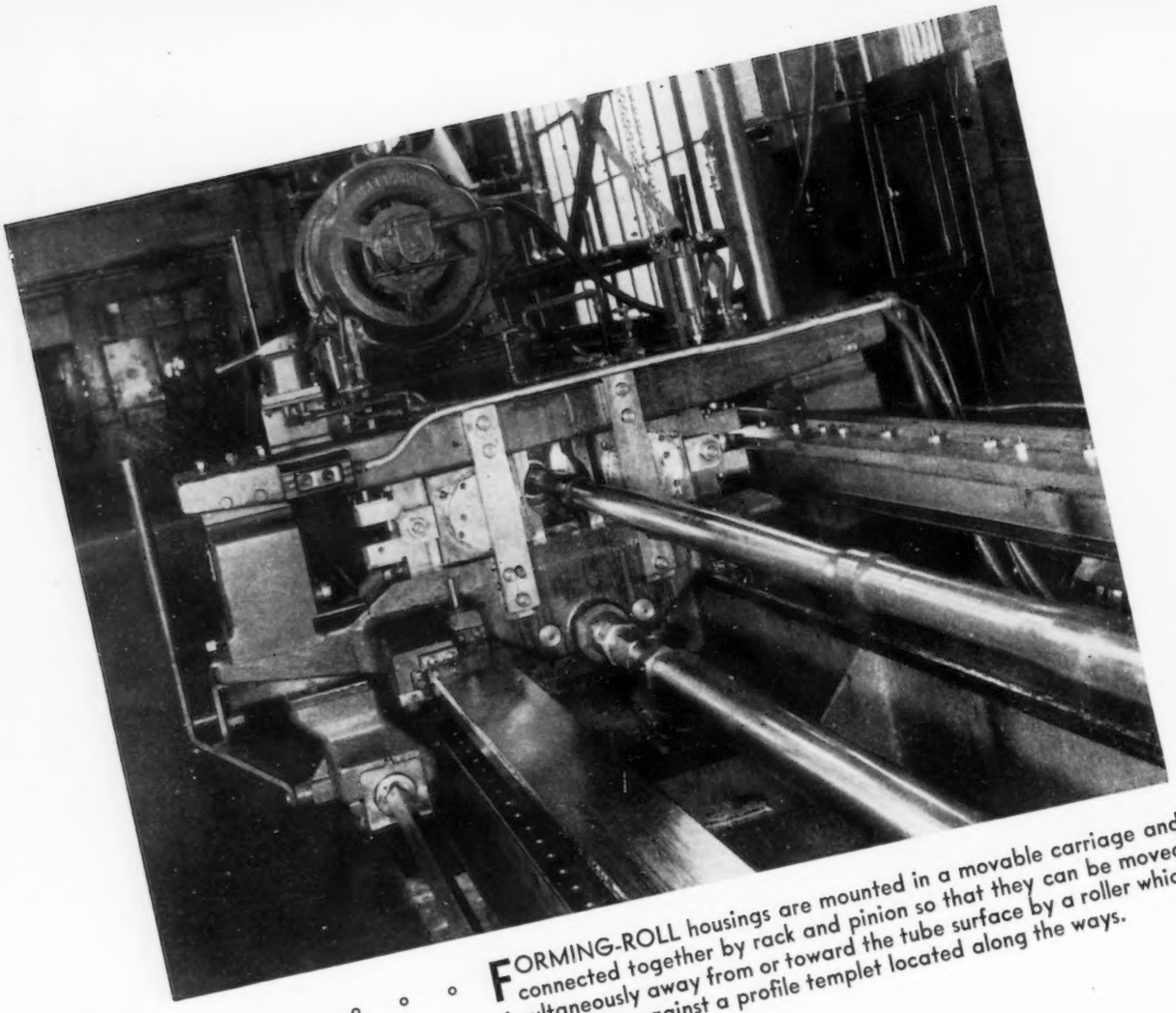
Control of tube wall thickness, very long tapers, double tapers, and taper in outside diameter and wall thickness are possible. The method was invented by Clarence L. Dewey and Sydney L. Dewey. A special machine operating along the lines of a lathe, with hydraulic pressure playing an important part in elongation of the tube, has been constructed by Steel and Tubes.

Some of the limitations of tubes step-tapered or otherwise reduced by previous methods have been a serious obstacle to designers. Lack of uniform maximum structural efficiency, and the high expense of certain operations have been among the disadvantages. The finished product often was not a continuous taper but really like a number of tubes joined together, each one of smaller size.

Among the advantages of tubing produced by the new process is the fact

CLOSE-UP of movable carriage, showing one of the two free-turning, shaping rollers which rotate by friction with the tube surface and spin it down to whatever diameter is called for.





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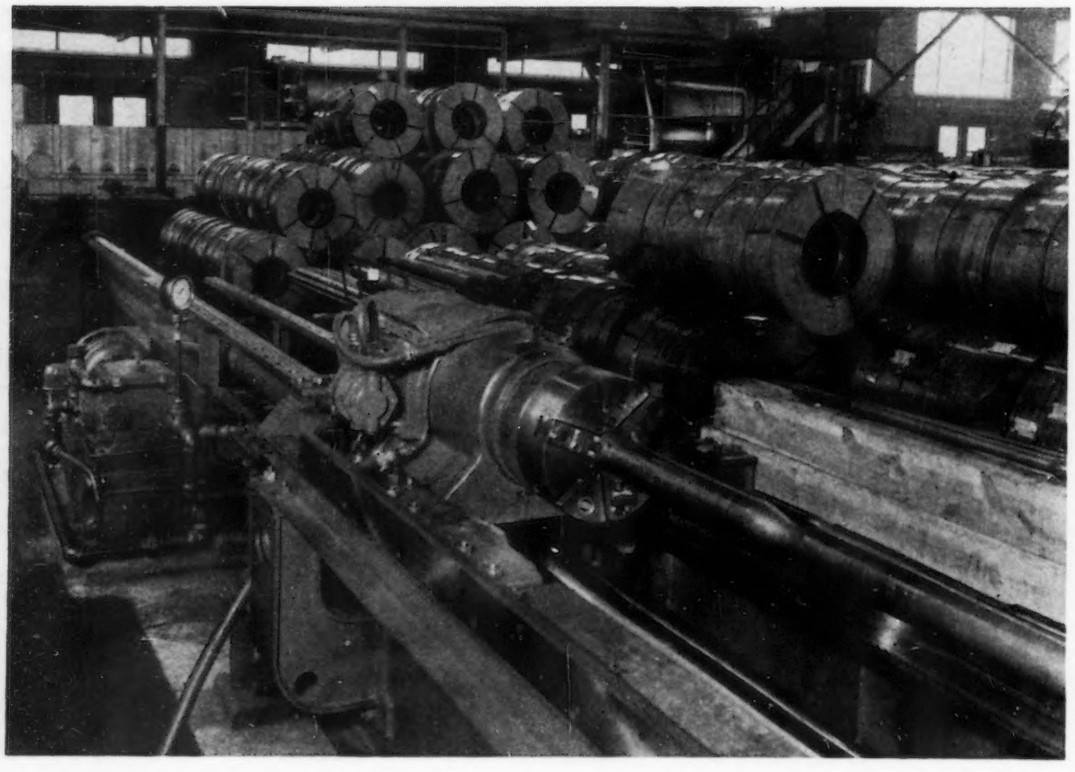
FORMING-ROLL housings are mounted in a movable carriage and connected together by rack and pinion so that they can be moved simultaneously away from or toward the tube surface by a roller which bears against a profile templet located along the ways.



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CLOSE - UP of the hydraulic pump equipment. Hydraulic pressure applied to the tail stock of the machine can be used to assist or resist the natural elongation of the tube, thus affecting the wall thickness of the tube.

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that wall thickness at the small end of a column may be increased for the accommodation of bearing loads. Danger of possible damage to thin walls at welded joints is overcome.

The Dewey process permits wall thickness to be maintained uniformly or increased or decreased almost at will in the reduced section. It is applicable to any seamless or electric welded tube with regular mill finish which could be cold worked. Steel, brass, copper, aluminum, bronze, nickel silver or Monel may be used. To date stainless has not been experimented with.

Viewed in operation, the process appears simple and unspectacular. The long tube shaping machine has a tail stock, traveling carriage, bed and a movable head stock. The tube to be tapered is chucked at each end and rotated and the forming proceeds toward the driving end of the machine. Elongation is accommodated by allowing the driving end to float. The tube is held in a bushing in the carriage. On each side of the tube on the carriage there is a free turning shaping roller which rotates by friction with the tube and spins it down. These two rollers are actuated from a profile templet along the ways. The hydraulic system is provided to assist or resist the natural elongation, thus affecting the wall thickness of the reduced section. Wall thickness is also controlled by selection of the proper shaping roll for any given job. No mandrels are used.

C. L. Dewey at one time manufactured musical instrument parts. Many operations were required to obtain a straight taper on brass wind musical instruments. First a flat sheet of brass was cut out by hand. The resulting fan shaped piece was clamped onto a mandrel, then paddled into trough form. The edges were notched and the tube overlapped and brazed by hand, the excess spelter filed off and the piece then hand hammered at the double seam, followed by annealing and cleaning. Placed on a lathe over a steel mandrel, it was spun down by hand, annealed and cleaned and ironed out on press, over a lead ring which expanded as the diameter increased.

The Deweys worked out the idea of a simplified, one-pass taper on a small lathe and formed the Metal Tube Shaping Corp., of Elkhart, which holds the two United States patents so far issued.

Straight, step and reverse tapers may be accomplished on the machine as well as practically any shape that can be turned from solid stock on a lathe except undercuts or sharp corners. Changing from one size tubing to another size and shape requires from 1 to 2 hr. Principal changes are the templet, rollers and bushings. Sometimes the rollers do not have to be changed.

It is asserted that reduction of light gage Electrunite SAE-1010-15 carbon welded tubing to 40 per cent of its original outside diameter may be accomplished, while heavy wall tube can be reduced to 50 per cent of its original diameter; low carbon seamless SAE-1010-15 to 60 per cent of its original diameter; light seamless and heavy wall seamless work down about the same. On chromium-molybdenum tubing, which is important to the aircraft industry, SAE-4130-X, the standard Government specification, has been used.

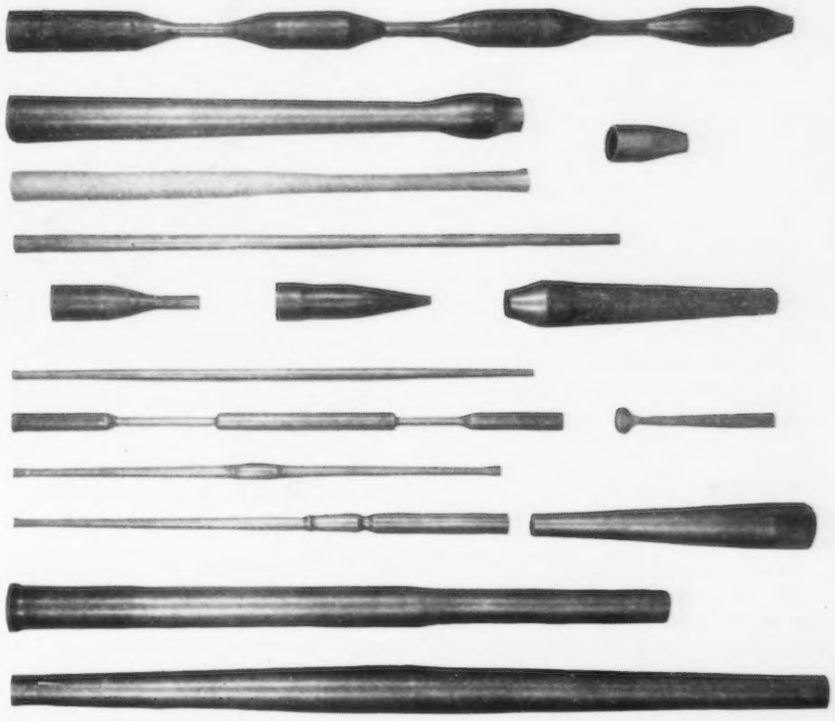
For landing gear struts and aircraft structural members, double tapered tube eliminates up to 20 per cent of the weight through reduction from the maximum diameter to the useable minimum at the small ends and the welding area is cut more than 50 per cent where the tubes join. In addition, as great strength is provided as if the full diameter ran all the way along the tube.

High strength aluminum alloy tubes may be reduced to 40 per cent of the original diameter, while lower strength aluminum alloys, half hard, may be reduced to 30 per cent of their original diameter.

Thickened tube ends for forging are possible by the Dewey Process. Designers are enabled to provide for necessary clearances at certain points by reducing the tube diameter for whatever distance may be necessary, with no loss of stiffness, although strength may be lost. Effects of vibration can be lessened.

On S.A.E. 1010 to 1015 boiler tube stock, which has yield point of 30,000 lb. per sq. in., reduced to 50 per cent of its original diameter and the wall either maintained, thickened or thinned, the yield point is increased to 70,000 lb., and Rockwell B hardness starting at about 55 increases to about 80. On 52-S aluminum alloy, reduced to 50 per cent of its original diameter, tensile strength is increased from 26,000 lb., to 36,000 lb. per sq. in. Increases in tensile strength of brass and copper are obtained. However, cold working of 4130-X chromium-molybdenum aircraft tubing does not increase the strength to the extent obtained in low carbon steels, but here normalizing is required anyway for the relief of undue strains.

Experiments have been conducted



EXAMPLES of tube-shaped work produced by the Dewey process. Long slow tapers or combinations of steep tapers and curves in long lengths of tubing are possible.

in heating the tube as it is formed, but present equipment is not suitable for hot working.

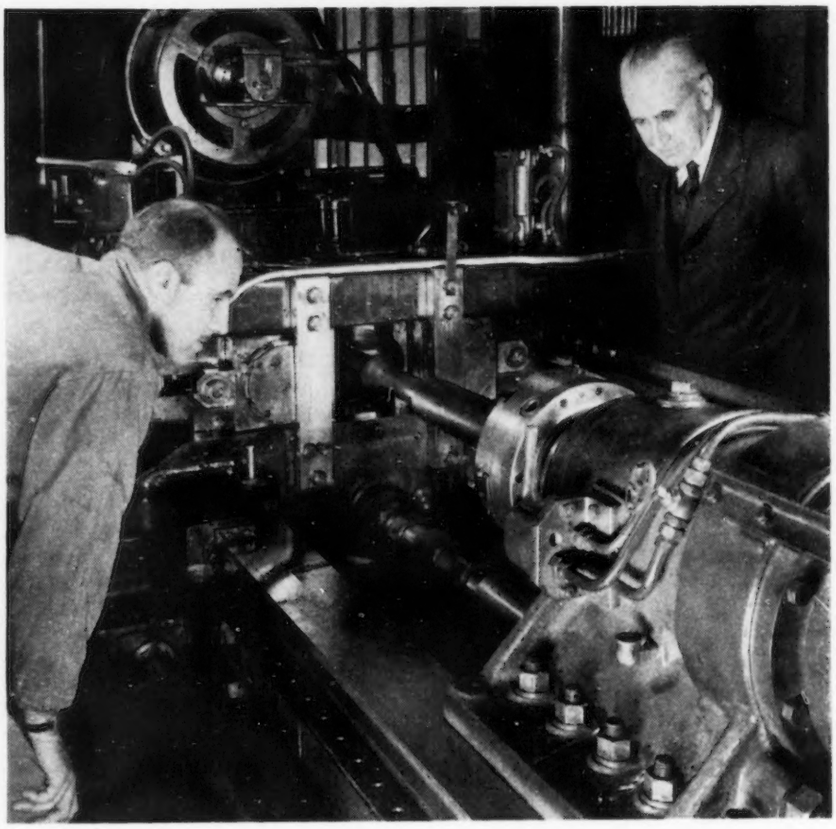
The machine was designed by Steel and Tubes' engineers and built by the Kent-Owens Machine Co., Toledo, Ohio. A 50-hp. Reliance motor drives the spindle which rotates the tube. A small motor on the hydraulic system positions the head stock. There is a 10-hp. motor on the rear pump and a small motor driving the coolant pump. Feeding speed and rapid traverse are controlled by an operating lever on the side of the carriage.

The whole operation must be done at one pass. Any mill scale is removed by the rolling and does not interfere with the operation. As the tube rotates and the forming roll kneads it down a soluble oil coolant prevents overheating.

The shaping rollers, which are moved radially to the tube by the templet, are geared together when only one templet is being used, but may be operated separately. Selection of rollers determines the limits within a certain classification as to wall control. Further variations depend on the changing pressure on the head stock from the hydraulic cylinder at the end of the machine.

The amount of reduction and profile radius of shaping rollers determines the wall thickness. Larger radius thickens the wall and smaller thins the wall. On heavy wall tubing the hydraulic cylinder on the head stock applies compression or tension to the tube to thicken or thin the wall

The present machine will take a tube 4 in. in diameter by 3/16 wall up to 20 ft. in length, and heavier gages may be accommodated for slight reductions.



THE inventors, Clarence L. Dewey and Sydney L. Dewey, are shown at the tube shaping machine.

A New Pickling Method

THE pickling process introduced by de Lattre and by some plants in Belgium where the process is being successfully used, has been described in detail by A. McLeod in Sheet Metal Industries (British). Since publication numerous comments have been put on record, some of which disagree with certain statements of the author.

However, in his article, Mr. McLeod discusses the disadvantages of regenerating liquors produced in hydrochloric-acid, which include the production of excess ferrous sulphate and of dense fumes of hydrochloric acid, and explains that these disadvantages are overcome in the de Lattre process by using sulphuric acid and ferrous chloride with an inhibitor. The most favorable conditions are produced when the pickling liquor contains per liter: 1 gm.-mol. of ferrous sulphate, ½ gm.-mol. of hydrochloric acid and 1 gm.-mol. of sulphuric acid. This solution is maintained at a constant temperature of 50-55 deg. C. by steam coils, and the ratio of the two acids is maintained during the whole pickling operation by appropriate additions of both acids and the inhibitor which consists of gelatin peptonised by hydrochloric acid. Pickling is carried on until the total ferrous-sulphate concentration reaches 326-394 gm. per liter, when the solution is passed to the recovery plant.

The recovery or regenerating plant is of particular interest, as it presents a complete solution to the problem of the disposal of waste pickling liquors. The spent liquor is first led into a preliminary settling tank in which unwanted sludge is separated out. From here the solution is syphoned into crystallizing tanks, the cooling system for which consists of multiple coils of lead pipes. The ferrous-sulphate crystals pass by gravity into a centrifugal drier and the liquid drawn off returns to a reservoir tank for redistribution in the pickling shop. At one Belgian works seven lots of liquor were regenerated per 8-hr. shift and 8.4 tons of ferrous sulphate were recovered per 24-hr. day; before the present war these crystals were sold in Holland at 30s. per ton.

The author outlnes the I.G. Farbenindustrie process of manufacturing sulphuric acid from ferrous-sulphate crystals, and concludes by emphasizing the advantages of using the de Lattre process for pickling steel strip.

Heat Treatment of Tool Steels

(A Simplified List of Instructions)

By JOHN ENGLISH
Research Engineer, Johnson Gas Appliance Co.

THE heat treatment of tool steels is an art, an art which has been developed by men who have carefully watched each detail in the heat treating operation.

The design of a tool has a great deal to do with the manner in which the tool will respond in the operation of heat treating. Tools with rough tool marked surfaces, or scale on surfaces, will show uneven quenching. This will set up surface strain, result in uneven hardness and possible breakage, either after the quench or in service. Sharp corners are a known enemy to the hardening operation. Where possible all sharp corners should be given a fillet, preferably a radius large as possible.

Uneven sections are very difficult to handle when bath quenched. Where the sections in the tool are vastly unequally balanced, air hardening steels will give good results in maintaining the shape and size of the tool.

As regards heating time, the furnace thermocouple should be close to the tool. When the entire tool exactly matches the thermocouple, soak 5 min. per in. of diameter or thickness. Then the entire tool is uniformly up to heat.

A second point—it has always been emphasized that tools should be heated slowly, even preheated if possible. This is supposed to inhibit warpage and cracking. Such preheating is recommended only on high speed steel. All other tool steels heated under 1900 deg. F. should be allowed to heat naturally; that is, get the furnace running steadily at the proper hardening temperature, then, without preheating, place the cold tool on the hot hearth (near the thermocouple) and let it heat "naturally" as fast as it will.

Natural heating is not only permissible, but it is actually desirable. This simple rule eliminates all worry on the part of the hardener as to how long he should take to heat a tool. Just put it in the furnace and watch it and the tool itself will indicate how long it takes.

It should be noted that tools that have been previously hardened should be annealed before rehardening.

All tool steels can be hardened free from soft skin or decarburized surface, if the following instructions for furnace atmosphere are followed.

To estimate the oxidizing atmosphere between 1 per cent oxygen and 5 per cent oxygen, heat the furnace to the proper temperature and put a small block of wood (not over ¾-in. square) on the hearth and close the door. Observe the way the wood burns through the hole in the door. If the wood smokes, and chars, but shows no visible flame, the atmosphere contains less than 1½ per cent oxygen. It may even be reducing. If the wood block smokes, then shows intermittent flashes of pale blue flame (with no yellow in the flame) the oxygen is between 1½ per cent and 2½ per cent. If the flame from the block is about half blue and half yellow, the oxygen is between 2½ per cent and 4 per cent. If the wood block burns with a steady yellow flame, and if the residual charcoal glows pretty much all over, the oxygen is about 5 per cent or above.

To judge excess oxygen of about 8 per cent to 10 per cent, put a small lump of soft coal on the hearth and observe it through the peep hole. Under 4 per cent oxygen the coal will smoke, but will show no flame. Between 4 per cent and 8 per cent there will be flame and smoke mixed. At 8 per cent to 10 per cent oxygen, there will be a trace of smoke—the coal will burn with a clear, luminous flame, and the remaining coke will definitely glow.

The above tests can be used to estimate oxidizing atmospheres in a gas-fired furnace, or an oil-fired furnace, or a gas curtain electric furnace.

The beneficial effects of furnace atmosphere will be felt only on those tool surfaces which are exposed to a continous circulation of furnace gases. The side of the tool that rests on the hearth, or holes and pockets containing stagnant gases will not profit from atmosphere control. The tool should be arranged in the furnace so that all surfaces requiring maximum hardness are continually washed with a gentle flow of furnace atmosphere.

It will be found much easier to control the atmosphere in a gas-fired hardening furnace if an inspirator is installed. The adjusting screw on the inspirator can be regulated to give the desired atmosphere—and after that the temperature of the furnace can be regulated by operating only one valve, without disturbing the atmosphere at all. Modern oil burners also are available that will give single valve temperature control, with a predetermined atmosphere.

Throttling the

This recent attack on the earmarks of a Trojan the system of

THE present popular pastime is the birth control of American invention. The current vogue seems to be to see to what extent the basis of the American system of enterprise can be destroyed where it is connected with invention—for those who hate capitalism know that a patent is a birth certificate of a new business, the fountain head of new capital.

This fight over the patent system is not a petty quarrel over a Government bureau—it is one phase of a determined struggle to preserve the American system of free enterprise.

This is not the first time that this has been tried. The originator of the scheme to throttle American inventive characteristics was England in the days of King George III. The American Revolution had its fundamental cause in the efforts of the British political royalists to throttle American invention, prevent the expansion of American manufacturing based upon invention and the employment of new machinery; and to prevent the export to the new Colonies of machines of improved manufacture from English inventors.

It would seem that after 150 years of remarkably successful demonstration of the American system of encouraging invention, that Americans would not imitate the very practices and principles of English restraint and English destruction of the American system of inventive encouragement. That is actually what is happening in this country today.

But as General Harbord says: "You study the past chiefly because of its bearing on the living present and its promise for the future." The United States patent system is unique in its freedom from taxation, its freedom to people of very modest means and its integrity. It is as American as pumpkin pie.

The reformers among the political royalists, who are now attacking the American patent system, remind the writer of the man who went hunting for rabbits and by mistake shot the farmer's cow. Ostensibly, the "popular front" is conducting this reform campaign for the protection of the "little man" and the helpless American "consumer." But the humorous aspect of the matter is, that if these economic royalists are really sincerely endeavoring to destroy the fancied hold upon the American patent system by the large and powerful corporations, they are very much mistaken. The large corporations in the United States do not need the patent system.

Indeed, there is no greater handicap than the patent system so far as large corporations are concerned when it comes to the question of competition with the smaller companies. The only hope of the small manufacturer, the individual, and the company of limited distribution and sales organization is the patent system. The large corporation with its vast resources, its research laboratories, and its facilities for powerful competitive action and national distribution does not need the protection of these limited monopolies to the same urgent degree that the smaller corporation does.

It is most wise to keep in mind this constant question of just for whom the patent system was designed by Thomas Jefferson, the first Commissioner of Patents, one of our first inventors, and the first patent lawyer. Certainly, that great protector of the comman man's interests would not have taken the patent system under his wing as his principal care while first Secretary of State unless he had thought it to be one of the fundamentals of democracy for the common man.

Now turning to the first reform proposal in order to change the patent system, it is best to examine this question of compulsory license and really understand what the proposal means.

Inventor

o o o

By H. A. TOULMIN, Jr.
Toulmin & Toulmin, Dayton

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patent system has all the Horse technique against free enterprise

Who are the people who want to change the American patent system? How many of them are there?

The writer has yet to find any advocate of these changes who ever earned a dollar as an inventor, a research man, engineer or a manufacturer. Many have been met who are professors, government officials without financial portfolio, economic theorists and members of the socialist and communist parties. If there be others outside of these categories, a somewhat extended experience with the opponents of the patent system has not included them.

It would seem that the first persons to complain would be the manufacturers who put the major portion of the money that goes into financing patent work, the manufacture and sale of patented articles and the taxation that supports the patent system. Strangely enough, this class who would be most vitally affected by serious abuses of the patent system recently voted that it should be maintained without impairment, including freedom of patentees to grant licenses unrestricted as to use, with a vote of 775 to 27.

A compulsory patent licensing system is communistic in principle and in fact, no matter what plausible arguments may be advanced in its favor. It has been tried in England and in Canada to demonstrate that it is a dismal failure. It is but a short step from the Government saying: "I will divide up upon demand a man's intellectual property in a patent" to saying "I will divide the rest of his property on demand." The art of communism is the art of indirect infiltration whether it be into labor union, educational institutions or into a system of government. The very essence of communistic strategy is to draw the Trojan wooden horses into the citadel.

This proposal of compulsory licensing of patents is but another phase of the proposal for compulsory licensing of business whether it be manufacturing, retailing, or running a gasoline station. Control goes to those who license. And control is the essence of a centralized government that is just as totalitarian as Russia.

Small Man Hit

As true of most such proposals, they strike at the small operator and the individual with the greatest violence and disaster. The only competitive weapon the smaller company has is the temporary monopoly of its patents against the competition of its larger brethren. One more safeguard of independent business will have been lost with the emasculation of the patent system.

It is frequently said that patents should be licensed because they are not being used. That is just like saying: "If your house is vacant through no fault of yours, you should be compelled to share the ownership of it at a price fixed by a single individual in distant Washington." There is no difference from forcible seizure and entry, possession and enjoyment by Governmental edict of your real estate than the proposal of the compulsory licensing of patents where your intellectual property is equally invaded. It is the old story of giving the "have-nots" a share of what they did not earn.

Another plausible argument is that without compulsory licensing the present license system so favors the few as to creat a drastic rise in price. Good common sense shows that this is the figment of the imagination of a theorist.

Substitutes for the patented product are always available. If the price of a patented product is too high, the public continues to use what it has always had. The most that the patentee can hope to secure is a fair price at a reasonable profit without the disaster

of cost cutting competition. Certainly, a patent is not a reserved seat to a party with unlimited prices because the public will always substitute something else. Economic law is far more powerful in controlling prices than any other single factor.

Aluminum at $5 per lb., Neoprene at $100 per lb., automobiles at $25,000 each have no hope of being bought just because they represent new and patented articles. Just test this for a moment. Look over the field and see how far new patented articles ever succeeded until they got down to a popular price. There are a very few people who would not use horses instead of automobiles at $25,000 each.

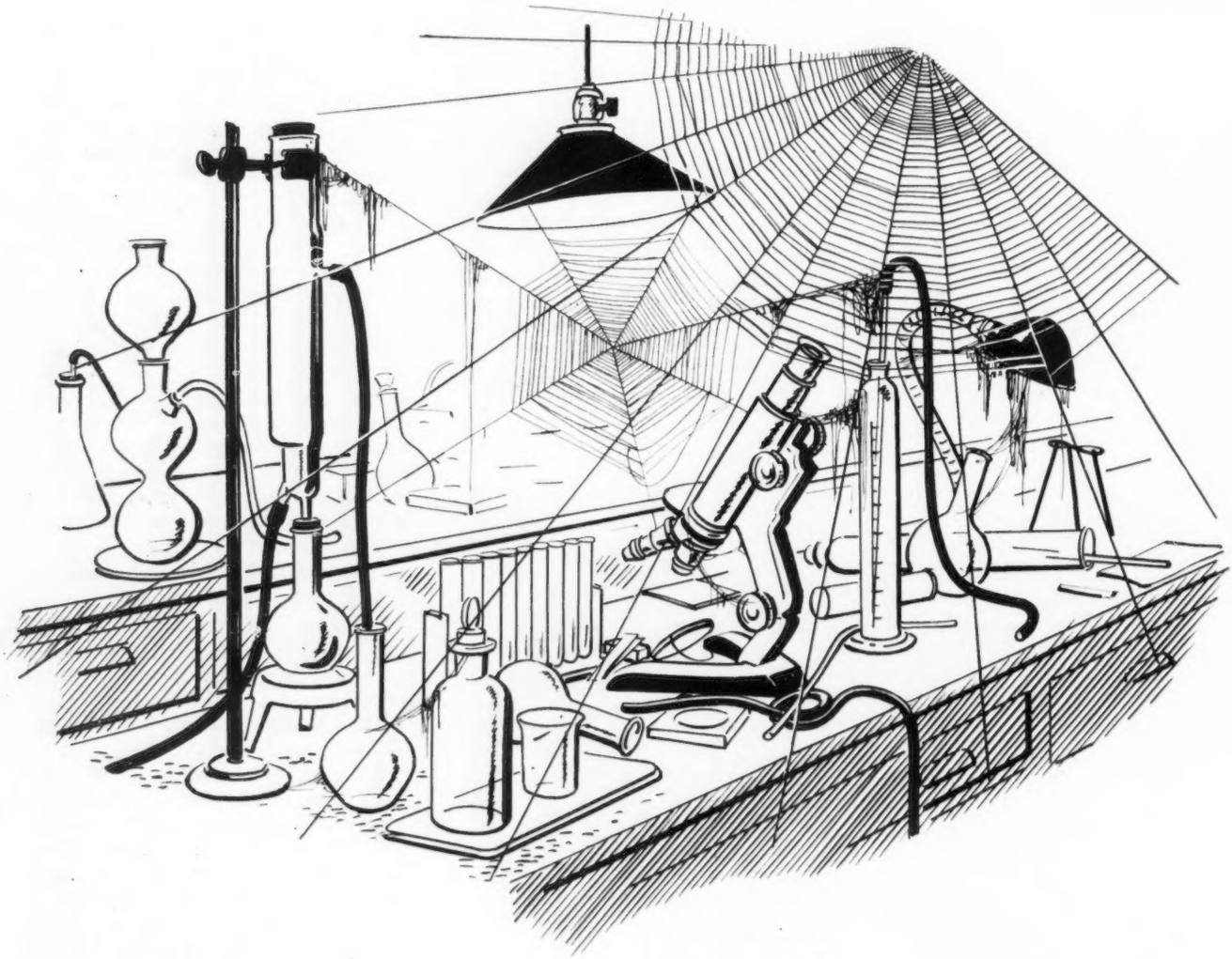
One of the odd quirks of mind of the critics of the patent system is that these people do not seem to understand that the laws of merchandising apply to patented articles as well as to anything else. Those who advocate compulsory licensing in order to be able to share in present valuable patents had better well heed Benjamin Franklin, who said: "They that give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety."

Another proposal is the single Court of Patent Appeals. The writer is not sure whether this proposal so ardently advocated by some Government officials now resident in Washington has any other merit than the possibility of furnishing them future employment. Further centralization of government in Washington is not only dangerous to the Republic but when the people generally must take their controversies for judicial settlement from all over this nation on private controversies over patents to a single court in Washington, the nation comes dangerously close to the situation prior to 1776 when justice was done for the American Colonies only in the Courts of London.

The colony of New York was 3000 miles from London and the patentee of California is 3000 miles from Washington. Just picture the predicament of a small company or an individual inventor deprived of the settlement of his patent suit in his home state and compelled to seek justice at a remote court 3000 miles away.

Is this the way to use the patent system to award inventors, and in the words of Lincoln, "to add the fuel of interest to the fire of genius," or is it really a new scheme to add a novel form of crucifixion to the humble litigant unfortunate enough to reside on the wrong side of the continent? The whole foundation of American government has been to keep the courts of the people among the people who are charged in those courts. The writer thinks this proposal warrants the caution of Robert L. Lund, of the Lambert Pharmacal Co., who recently said: "We must make sure that the patent system does not suffer the fate that has overtaken many other of the stimulants to free enterprise in America."

Another companion curiosity is the fact that these advocacies of patent revolution come from members of the Department of Justice who are more concerned as advocates of social reform to change the law to what they



want it to be than with the desire to enforce the law as it is. It seems strange that the executive branch of the Government is thus usurping the duties of the legislative branch and, by the administration of the Department of Justice, endeavoring to do by the powerful arm of the law branch of the Government what the wisdom of Congress has not yet authorized it to do. Perhaps the difficulty with enforcement of the anti-trust laws lies in the fact that those charged with the duty of enforcing them are too busy with the more attractive art of social reform of our laws instead of getting the most out of laws as they stand.

This is best evidenced by the fact that the Department of Justice is demanding the harsh penalty of the forfeiture of patents and the complete elimination of all rights of a patentee to control the use of his patent by his licensees or his competitors. These proposals would mean a substantial dedication of the patent to the public and make the present monopoly a hollow mockery. So far as the writer knows, none of the members of the Department of Justice advocating these drastic changes has ever been an inventor, patentee, manufacturer under patents or a patent lawyer of experience. We cannot help but judge of the merit of a man's proposals by the knowledge, experience and accomplishments of practical values behind him.

The distinguished Director of Mellon Institute, Dr. E. R. Weidlein, makes a sound observation when he says: "each patent issued seems to create a new idea for further patents." In less than a quarter of a century chemical research has developed 200,000 new compounds. The value of the products from the process industries has increased in a quarter of a century $8,000,000,000.

There are 2000 industrial research laboratories with a staff of 50,000 scientists operating on a budget of more than $2,000,000 consistently at work in this country in the creation of new products and new business. Out of these laboratories come the birth certificates of new business.

Why should any person or firm make such an expenditure if the result of it would be immediately licensed to the public as would be the case without patents? Obsolescence is one of the first results of research and it is obsolescence that creates new opportunities for new factories, new machinery and new products.

The steel industry in recent years has spent more than $10,000,000 for industrial research, employing the services of 2500 technical men on full time and 1300 others on part time. One-fifth of these activities is devoted to the development of new products alone. One-third of it goes to improving the quality of existing products and another fifth to the improvement in manufacturing methods. The hard headed steel industry has invested more than $9,000,000 in research facilities for the good practical reason that such protected investment under patents will more than amortize itself with a decent profit. It took more than a $6,000,000 investment of five leading industrial concerns to make available a new laminated safety glass. Such investment would hardly have been made without the benefit of the patent system.

A good example of how price is brought down by invention is the case of "iso-octane," the arbitrary standard in the anti-knock scale for rating motor fuels. A decade ago this laboratory curiosity sold for $30 per gal. Today 20,000,000 gal. are being purchased by the aviation industry at 30c. per gal. Additional plants are under consideration which will bring the total quantity up to 125,000,000 gal. annually.

In 1862 the Pennsylvania Railroad imported from England 100 tons of steel rails at $150 per ton. These rails were of irregular length of something over 20 ft. and only weighed 40 to 60 lb. per yard. Contrast the present price of this product and the outcome of the efforts of research and invention in the steel industry becomes obvious.

As inventions in a country devoted to manufacturing are the very life blood of expanding business, it is quite obvious that those who do not like the American method of doing business have made the patent system the focal point of attack. If new ideas represented by invention can be removed from the control of manufacturers, so that new capital can not be created, and if the right to depreciation can be eliminated so that old capital cannot be restored; it is obvious that the capitalistic system has come to the end of the road.

Automatic Welding with a "Lying" Electrode

IN welding with a "resting" electrode, a coated electrode is placed along the V or gap to be welded, according to S. Z. Shterling, in a recent article in Vestnik Metallopromyshlennosti (Russian).

Current is supplied to one end of the electrode and an arc is struck between the other end and the work; the arc continues to burn and move along the seam without further attention. Early experiments in this direction were, however, unsuccessful, owing to distortion of the electrode by the heat and its erratic behavior.

Work in Russia towards the end of 1938 led to the development of an eccentrically coated electrode for this method of welding, the thin side of the coating being placed downwards in contact with the metal to be welded, while the upper thicker side of the coating, which took longer to fuse, formed a protective "hood" over the arc. Satisfactory results were obtained in this way.

In the experiments described by the author, electrodes with an ordinary coating were used. After the electrode had been placed in the seam it was covered by a layer of paper, over which was placed a copper bar with a groove on the under side. The copper bar was held down by screw clamps. The tests were made on mild steel. A special coating free from organic material and consisting of 37.7 per cent of titanium ore, 28.6 per cent of manganese ore, 20.4 per cent of ferro-manganese and 13.3 per cent of feldspar, and made up with water-glass, was developed. A steady arc was obtained with this coating, and the finished welds had a high ductility.

Alternative British and American Alloy Steels

WHAT with the great amount of work now being done in this country for British interests, there is frequent confusion regarding British designations on steel specifications and the proper American equivalents. In view of the many queries for information which have come to THE IRON AGE, two tables are reproduced herewith which should aid greatly in supplying proper steel parts for export orders. The table below shows possible alternative British and American S.A.E. steels, based on chemical composition. And, the table on the opposite page shows the chemical compositions of British and American nickel alloy steels.

The table below and the table shown on the opposite page range through the case hardening, direct hardening, and the corrosion and heat resisting grades of alloy steel.

COMPARISON OF POSSIBLE ALTERNATIVE BRITISH AND S.A.E. STEELS

(Based on Chemical Composition)

Type	Steel	BRITISH STEELS				S.A.E. STEELS	
		B.S. Aircraft	B.S. General	D.T.D.	S.M.M.T. (Prov.)	S.A.E. No.	Remarks
CASE HARDENING	1% nickel	—	—	—	—	2115	The nickel content of S. A. E. 2115 is higher.
	2% nickel	—	5005/102	—	—	2115	
	3% nickel	3S15	5005/103	—	9	2315	The maximum carbon limit of S. A. E. 2315 is higher.
	5% nickel 5% nickel	S.67 S.90	5005/104 —	— —	10 —	2512 2515	The maximum carbon limit of S.A.E. 2515 is higher. S.90 may also contain molybdenum, whereas S.A.E. 2515 has none.
	1¾% nickel-molybdenum 1¾% nickel-molybdenum 3½% nickel-molybdenum	— — —	— — —	— — —	— — —	4615 4620 4815	
	3½% nickel-chromium	—	682-1936	—	11	3415	The maximum carbon limit of S.A.E. 3415 is higher and the chromium range is lower.
	4¼% nickel-chromium	S.82	—	—	12	3312	The nickel range of S.A.E. 3312 is lower. A steel is made in the U.S.A. known as "Krupp Steel" which is similar to S.82.
DIRECT HARDENING	1% nickel	3S6, 2S76	5005/203 5005/204	—	13	—	There is no equivalent S.A.E. 1% nickel steel.
	3% nickel	— —	5005/401 5003/403 5007/405	—	14 —	2330 2330	The lower half of the carbon range of S.A.E. 2330 should be used, or alternatively the upper half of the carbon range of S.A.E. 2320.
	3½% nickel	S.69	5005/402	—	15	2340	
	5% nickel	3S4	—	—	—	2515	The upper carbon content of S.A.E. 2515 should be used.
	1¾% nickel-molybdenum	—	—	—	—	4640	
	1½% nickel-chromium 1½% nickel-chromium-molybdenum	— —	5005/503 —	— —	— 19	3240 X4340	The chromium range of X4340 is lower but overlaps.
	2½% nickel-chromium-molybdenum	— —	— —	— —	20 22	— —	There are no equivalent S.A.E. steels.
	3% nickel-chromium	S.65	—	—	—	3325	The ranges for nickel and chromium in the S.A.E. 3325 are somewhat higher. S.65 often has molybdenum present whereas S.A.E. 3325 contains none.
	3½% nickel-chromium	4S11 2S81	5005/501 —	— —	21 —	3435 3435 3335	The carbon range of S.A.E. 3435 is higher but overlaps. The carbon range of S.A.E. 3435 is higher but overlaps. The lower end of the carbon and chromium ranges of S.A.E. 3335 should be used. Molybdenum is often present in 2S81 and 4S11, but S.A.E. 3335 and S.A.E. 3435 have none.
	3½% nickel-chromium (80 ton)	—	—	331	—	3335	The same remarks apply as for 2S81.
	4¼% nickel-chromium	2S28	5005/502	—	23	—	There is no equivalent S.A.E. steel.
	3½% nickel-chromium (sheet and strip)	S.86, S.87, S.88	—	—	—	—	Modified S.A.E. 3435 or 3335 could be employed.
CORROSION- & HEAT-RESISTING, ETC.	18/8 chromium-nickel	—	—	176A, 171A, 166A, 181A, 189	—	30905	S.A.E. 30905 should be stabilized against "weld decay" to conform to the requirements of the D.T.D. specifications.
	18/2 chromium-nickel	S.80	—	—	—	—	There is no equivalent S.A.E. steel.
	13/13/3 chromium-nickel-tungsten	—	—	49B	—	—	There is no equivalent S.A.E. steel.
	High expansion	—	—	247	—	—	There is no equivalent S.A.E. steel.

CHEMICAL COMPOSITIONS OF BRITISH AND AMERICAN NICKEL ALLOY STEELS

Type	Steel	Specification	CHEMICAL COMPOSITION, PER CENT												Remarks
			C		Mn		S	P	Ni		Cr		Mo		
			min.	max.	min.	max.	max.	max.	min.	max.	min.	max.	min.	max.	
DIRECT HARDENING	1% nickel	3S6, 2S76	0.35	0.45	—	1.20	0.05	0.05	—	1.00	—	—	—	—	
		B.S. 5005/203	0.35	0.45	0.40	0.80	0.06	0.06	—	1.00	—	—	—	—	Min. Ni limit is 0.3% in B.S. 5005/204.
		B.S. 5005/204													
		S.M.M.T. 13	0.35	0.45	0.80	1.20	0.05	0.05	0.75	1.20	—	—	—	—	
	3% nickel	B.S. 5005/401	0.25	0.35	0.35	0.75	0.05	0.05	2.75	3.50	—	0.30	—	—	
		B.S. 5008/403													
		S.M.M.T. 14	0.28	0.35	0.50	0.80	0.05	0.05	3.00	3.50	—	0.30	—	—	
		S.A.E. 2330	0.25	0.35	0.50	0.80	0.05	0.04	3.25	3.75	—	—	—	—	
		B.S. 5007/405	0.20	0.30	—	0.60	0.04	0.04	2.50	3.50	—	—	—	—	Si 0.25% maximum.
	3½% nickel	S.69													
		B.S. 5005/402	0.35	0.45	0.50	0.80	0.05	0.05	3.25	3.75	—	0.30	—	—	
		S.M.M.T. 15													
		S.A.E. 2340	0.35	0.45	0.60	0.90	0.05	0.05	3.25	3.75	—	—	—	—	
	5% nickel	3S4	—	0.25	—	0.60	0.05	0.05	4.50	5.00	—	0.20	—	—	
		S.A.E. 2515	0.10	0.20	0.30	0.60	0.05	0.04	4.75	5.25	—	—	—	—	
	1¾% nickel-molybdenum	S.A.E. 4640	0.35	0.40	0.50	0.80	0.05	0.04	1.65	2.00	—	—	0.20	0.30	
	1½% nickel-chromium	B.S. 5005/503	0.35	0.42	0.45	0.65	0.05	0.05	1.25	1.75	0.75	1.25	—	—	
		S.A.E. 3240	0.35	0.45	0.30	0.60	0.05	0.04	1.50	2.00	0.90	1.25	—	—	
	1½% nickel-chromium-molybdenum	S.M.M.T. 19	0.35	0.42	0.45	0.65	0.05	0.05	1.25	1.75	0.75	1.25	0.20	0.40	
		S.A.E. X4340	0.35	0.45	0.50	0.80	0.05	0.04	1.50	2.00	0.60	0.90	0.20	0.30	
	2½% nickel-chromium-molybdenum	S.M.M.T. 20	0.28	0.35	0.40	0.70	0.05	0.05	2.30	3.00	0.50	1.00	0.50	0.70	
		S.M.M.T. 22	0.40	0.45	0.40	0.70	0.05	0.05	2.30	3.00	0.50	1.00	0.50	0.70	
	3% nickel-chromium	S.65	0.22	0.28	0.35	0.65	0.05	0.05	2.75	3.50	1.00	1.40	—	0.65*	
		S.A.E. 3325	0.20	0.30	0.30	0.60	0.05	0.04	3.25	3.75	1.25	1.75	—	—	
	3½% nickel-chromium	4S11	0.25	0.35	0.45	0.70	0.05	0.05	2.75	3.75	0.50	1.00	—	0.65*	
		B.S. 5005/501	0.28	0.34	0.45	0.70	0.05	0.05	3.00	3.75	0.50	1.00	—	—	
		S.M.M.T. 21	0.25	0.35	0.45	0.70	0.05	0.05	3.00	3.75	0.50	1.00	—	0.65*	
		2S81	0.28	0.35	—	0.70	0.05	0.05	3.00	3.75	0.50	1.30	—	0.50*	
		S.A.E. 3435	0.30	0.40	0.30	0.60	0.05	0.04	2.75	3.25	0.60	0.95	—	—	
	3½% nickel-chromium (80 ton)	D.T.D. 331	0.25	0.40	—	0.70	0.05	0.05	3.00	4.50	0.75	1.50	—	0.65	
		S.A.E. 3335	0.30	0.40	0.30	0.60	0.05	0.04	3.25	3.75	1.25	1.75	—	—	
	4¼% nickel-chromium	2S28	0.25	0.32	0.35	0.60	0.05	0.05	3.75	4.50	1.00	1.50	—	0.65*	
		B.S. 5005/502	0.25	0.35	0.35	0.60	0.05	0.05	3.75	4.75	1.00	1.50	—	—	
		S.M.M.T. 23	0.28	0.33	0.35	0.60	0.05	0.05	3.75	4.50	1.00	1.50	—	0.65*	
	3½% nickel-chromium (sheet and strip)	S.86, S.87, S.88	0.25	0.35	—	0.70	0.05	0.05	3.00	5.00	0.50	1.50	—	0.50*	
CASE HARDENING	0.5% nickel	S.A.E. 2015	0.10	0.20	0.30	0.60	0.05	0.04	0.40	0.60	—	—	—	—	No official B.S. specifications, but produced by several British steelmakers.
	1% nickel		0.12	0.18	0.80	1.00	0.05	0.05	0.50	1.00	—	—	—	—	
	1½% nickel	S.A.E. 2115	0.10	0.20	0.30	0.60	0.05	0.04	1.25	1.75	—	—	—	—	
	2% nickel	B.S. 5005/102	—	0.15	—	0.60	0.05	0.05	1.50	2.25	—	0.30	—	—	
	3% nickel	3S15	0.10	0.15	0.20	0.60	0.05	0.05	2.75	3.50	—	0.30	—	—	
		B.S. 5005/103	—	0.15	0.20	0.60	0.05	0.05	2.50	3.50	—	0.30	—	—	
		S.M.M.T. 9	0.10	0.15	0.30	0.60	0.05	0.05	2.75	3.50	—	0.30	—	—	
		S.A.E. 2315	0.10	0.20	0.30	0.60	0.05	0.04	3.25	3.75	—	—	—	—	
	5% nickel	S.67	0.08	0.14	—	0.35	0.05	0.05	4.60	5.20	—	0.10	—	—	
		S.M.M.T. 10	0.08	0.14	0.20	0.45	0.05	0.05	4.60	5.20	—	0.10	—	—	
		B.S. 5005/104	—	0.15	—	0.40	0.05	0.05	4.50	6.00	—	0.30	—	—	
		S.90	—	0.16	—	0.60	0.05	0.05	4.50	5.50	—	0.30	—	0.50*	
		S.A.E. 2512	0.10	0.14	0.30	0.60	0.05	0.04	4.75	5.25	—	—	—	—	
		S.A.E. 2515	0.10	0.20	0.30	0.60	0.05	0.04	4.75	5.25	—	—	—	—	
	1¾% nickel-molybdenum	S.A.E. 4615	0.10	0.20	0.40	0.70	0.05	0.04	1.65	2.00	—	—	0.20	0.30	
		S.A.E. 4620	0.15	0.25	0.40	0.70	0.05	0.04	1.65	2.00	—	—	0.20	0.30	
	3½% nickel-molybdenum	S.A.E. 4815	0.10	0.20	0.40	0.60	0.05	0.04	3.25	3.75	—	—	0.20	0.30	
	3½% nickel-chromium	B.S. 682-1936	0.10	0.15	0.30	0.60	0.05	0.05	3.00	3.50	0.80	1.10	—	—	
		S.M.M.T. 11													
		S.A.E. 3415	0.10	0.20	0.30	0.60	0.05	0.04	2.75	3.25	0.60	0.95	—	—	
	4¼% nickel-chromium	S.82	—	0.18	—	0.50	0.05	0.05	4.00	4.50	1.00	1.60	—	0.50*	
		S.M.M.T. 12	0.12	0.18	0.30	0.50	0.05	0.05	4.00	4.50	1.20	1.50	—	0.50*	
		S.A.E. 3312	—	0.17	0.30	0.60	0.05	0.04	3.25	3.75	1.25	1.75	—	—	Ni content is below that of S.82.
CORROSION- AND HEAT-RESISTING, ETC.	18/8 chromium-nickel	D.T.D. 176A													
		D.T.D. 171A													
		D.T.D. 166A	—	0.20	—	1.00	—	—	6.00	—	12.00	—	—	—	W, Ti, Mo, Cu and V may be present.
		D.T.D. 181A													
		D.T.D. 189													
		S.A.E. 30905	—	0.08	0.20	0.70	—	—	8.00	10.00	17.00	20.00	—	—	
		S.A.E. 30915	0.09	0.20	0.20	0.70	—	—	8.00	10.00	17.00	20.00	—	—	
	18/2 chromium-nickel	S.80	—	0.25	—	1.00	—	—	1.00	—	16.00	20.00	—	—	Si 0.5% maximum.
	13/13/3 chromium-nickel-tungsten	D.T.D. 49B	0.35	0.50	—	1.50	—	—	10.00	—	12.00	16.00	—	—	Si 1.0—2.5% W 2.0—4.0%
	High Expansion	D.T.D. 247	—	0.70	3.50	5.50	—	—	11.00	14.00	3.00	—	—	—	Si 0.5% maximum.

* Molybdenum, as well as 0.25% maximum vanadium and 1.00% maximum tungsten, is optional.

N.B.—Silicon range of all S.A.E. basic open hearth alloy steels is 0.15 to 0.30%. For electric and acid open-hearth alloy steels it is 0.15% minimum.

The silicon content of the S., B.S. 5005, B.S. 5007, B.S. 5008, D.T.D. and S.M.M.T. series is 0.30% maximum unless otherwise stated.

Influence of *Basis Metal* on

DEFECTS in basis metal show up in electroplates, and the nature of these defects and how they influence the plate are described in this article. Last week the author dealt with research work that has been carried out on this subject; and herein, in conclusion, these research data are translated into practical manufacturing operations.

PRACTICAL CONSIDERATIONS: Translated into practical manufacturing operations, even after allowing for differences of opinion on points still obscure, it is clear that the properties of the plate are affected by the condition of the basis metal. This situation has been discussed at length from the practical point of view by Hogaboom[18], who pointed out a number of variables in the basis metal which affect the subsequent electrodeposit.

All metals can be covered with special finishes, but by far the most generally used basis metal is steel. Consequently there is more information about its effect on the plate than about any other metal. It is known that in cold rolling, for example, strains are set up; the sheet will "pull coarse." And unless these strains are relieved (as for hot tinning, where the sheet is annealed at 1000 deg. F.) this condition is likely to affect the finish. Moreover, steel under strain, like brass when it is "season cracking," corrodes more rapidly than metal with the strains relieved; and of course, at the same time spoils the finish.

Experience has shown that in the rolling of sheet metals, scale, oxide, slag and other impurities may be rolled into the metal. When the sheet is given the final polishing roll, the metal may be flowed over these inclusions. If such sheet is polished before plating, sufficiently to remove the skin and expose the inclusions, poor plating will result. This effect is best illustrated in the paper by Hothersall and Hammond, cited above, where during rolling of the sheet steel, figures had been chalked on the sheet and subsequently rolled in. When the skin was removed by etching and the sheet plated with nickel, the chalked figures were indicated closely by pores at the points which outlined the figures.

Invisible oxide films on the basis metal may render it "passive," preventing adhesion and resulting in blistering or peeling. These films will also reduce the conductivity of the basis metal.

Fulforth has devoted much attention to this problem, insisting on the improvement of the base metal for continuously satisfactory plates. Probably the present methods of manufacturing steel strip show best how the steel industry is awakening to its share of the responsibility for producing properly finished metal products. Only a few years ago, cold rolled steel could not be plated with any degree of uniformity, being made by the one-skin pass in which a hot rolled ingot in its final stage was allowed to cool, and then given a single cold reduction of a few thousandths of an inch "to close its wide open pores." If this piece had been plated without grinding or polishing it might have produced an acceptable job. However, the grinding operation after forming went through the skin and disclosed the porous structure below, and the deeper the polishing went, the more holes developed making a smooth surface impossible. Consequently, a full cold rolled strip was developed with practically uniform structure throughout.

Other faults were present, however. In the forming operations, some edges and corners showed orange peel effects resulting in porous plate on those parts. Consequently, grain sizes were studied and specifications were set up by the American Society for Testing Materials in 1933 in the form of a grain size chart with sizes from No. 1 to No. 8, No. 8 having 96 grains or more per square inch at 100 magnifications. The result of working to this chart was the elimination of the need for polished formed edges, since the grains are small enough to be invisible to the naked eye and consequently easily covered by buffing the plate after application.

This was followed in steel practice by work on the elimination of other surface defects, such as slag, inclusions, roll marks, handling scratches, etc. By returning the billet and cropping off a good portion, slag was practically eliminated, and improved methods of roll grinding, together with more rigid inspection, helped to reduce crevices to a minimum.

Today, steel strip for normal press operations (except for deep drawing) requires no grinding or polishing before plating, but only an occasional spot polishing job to remove defects caused by faulty press work or careless handling.

Further corroborative evidence is the tentative conclusion arrived at in the joint research of the American Electroplaters' Society and the American Society for Testing Materials and the National Bureau of Standards in their "Summary of Exposure Tests of Plating on Steel and Non-Ferrous Metals," dated March 1, 1939, on tests conducted since April, 1936. A lot of special full cold-rolled steel appeared to be somewhat superior as a basis metal for plating nickel and chromium to a lot of regular steel (SAE 1010),

[18] What Is Under the Plate?, by G. B. Hogaboom; Monthly Review of the American Electroplaters' Society, Aug., 1934, pp. 5-13.
[19] Constructive Pre-plating Methods, by Frederick Fulforth, Metal Industry, June, 1939, pp. 267-9; July, 1939, pp. 323-324.
[20] Steel for Plating Purposes, by Frederick Fulforth, Metal Industry, March, 1938, pp. 127-8.
[21] Mirror Strip with Carbide Rolls, by T. C. Campbell, THE IRON AGE, Feb. 1, 1940, pp. 44-46.
[22] Transactions American Electroplaters' Society, 1936, p. 254.

the Plate

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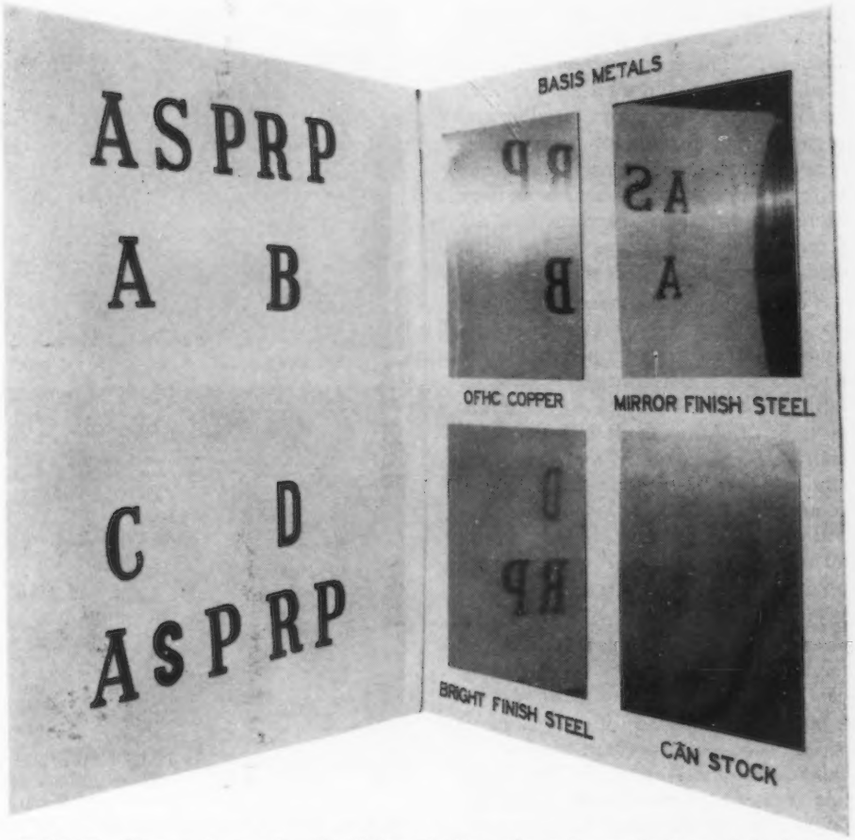


FIG. 7—Comparison of reflectivity of silver deposits on basis metals shown in Fig. 6. Courtesy American Electroplaters' Society.

both with respect to blistering and protection against corrosion. This investigation will be continued to determine whether such differences in the behavior of two or more lots of steel are related to measurable properties of the steel, which may then be used in appropriate specifications.

Valuable practical recommendations are made by Fulforth[20], who points to reductions in the cost of finishing and in the overall cost of manufacture resulting from "buying the best cold rolled strip procurable to your specifications, properly boxed, papered, and inspected . . ." The specifications he recommends are summarized in part below:

FINISH: Free from handling marks, scratches, rolled shear edges, dents, dirt and blemishes which would have to be removed by polishing. Must have a degree of brightness given by the last cold pass, which makes "cutting down" unnecessary. (Known to the mill as No. 3 finish.)

OILING: Oil or grease of lanolin base, or any other 100 per cent saponifiable composition which will not dry out or shrink during storage.

PAPERING: All sheets separated from each other by a special sulphite type paper, free from chemicals which would attack the steel, or from solid impurities which would mar or scratch the steel.

BOXING: Strip boxed in convenient weights, not over 500 lb. To be opened with the best side of the steel up, covered with the paper which stays on the strip through the stamping operations, to preserve the best side for the finish.

TEMPER: "B" Rockwell hardness of 45 to 55 is recommended for most press shop operations, with the low side preferable as the material age-hardens as much as 5 points. (Best arranged by agreement with the mill after a satisfactory sample has been submitted.)

GRAIN SIZE: Arrange by agreement with the mill after submission of a satisfactory sample, which will be free from egg shell or orange peel effects, or breaks of any kind.

Brass, of course, may be purchased in the same fashion under similar specifications.

A specific example of the awareness of the steel industry to this situation is the comparatively recent production of "mirror finish" strip, produced with carbide rolls, for subsequent nickel or other plating.[21] The surface of the strip checked with profilometer, is said to show a maximum surface variation of 0.000003 in.

An interesting indication of the importance of care in handling the basis metal is the practice reported by Hogaboom[22] in the manufacture of small, highly decorative novelty items, like cigarette cases. These parts are cut and blanked without putting in the design, but the blank is first sent to the plating room and plated with copper. It is then sent back to the press room and the design put on, using a highly polished die. The copper plated on the steel acts as a lubricant. The smooth die gives it a perfect surface and the deposited metal is burnished. The parts are simply trimmed and colored up on a soft buff, and then sent to the plating room for final nickel or chromium plating. (See Figs. 6 and 7.)

Another example of such care is the practice in some plants, of hanging their parts on racks between stamping or machine shop operations, instead of throwing them or even laying them in tote boxes and pans, in order to prevent nicking and other forms of marring.

But these are by no means all of the problems. It is known, for example, that cold work has a definite effect on the magnetic properties of iron. Hogaboom has suggested the possibility, at least, that cold work will affect

the distribution of the current over the unrelieved parts of the steel in the plating bath. What are the conditions of the other metals used as bases for finishes? There are copper, zinc, tin, lead, aluminum, and their alloys; brass, bronze, die casting alloys, pewter, antimonial lead, duralumin, nickel silver, etc; castings in all forms, sheet, rod, wire, tube, stampings and spinnings. Here are different structures and different surface conditions. How do all of these variables affect the finishes?

To these questions there are as yet no definite answers. These are the problems still confronting the industry. It has been learned that faults in the basis metal are likely to be transmitted to the finish. It is known that many conditions retard and may actually prevent the application of a good coating. This knowledge may be counted as gain. But the answers to all of the many special problems wait upon much painstaking investigation.

However, one simple conclusion is clear from the known facts. For better deposits, start with the brightest basis metal available and then perform a minimum of polishing operations on it. This means close attention to the fabrication and forming. Dies should not scratch or mar the finish of the metal. Work should be handled carefully during and between operations. If, due to the great deformation necessary in certain cases, the skin is "opened" and the surface is roughened sufficiently to require polishing, metal with the least possible quantity of inclusions should be used. Many instances have been reported of thin plates which stood up in service much better than heavy coatings, and the best explanation is that the basis metal was of such character as to promote a better, less porous plate.

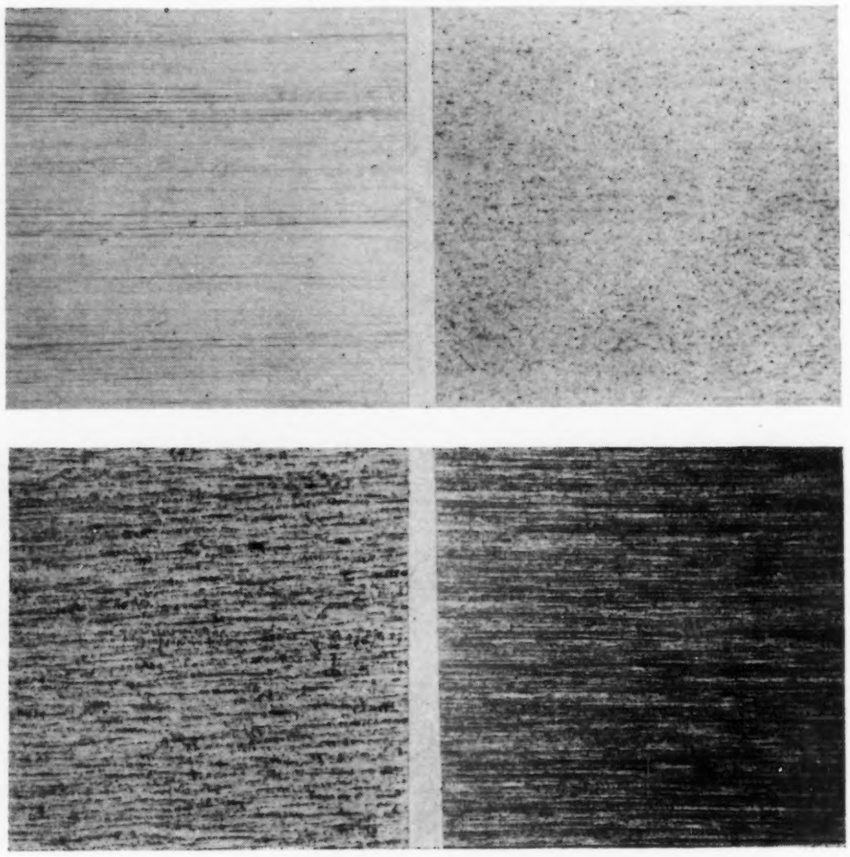


FIG. 6—Basis metals used for comparison of silver deposits on various surfaces. Courtesy American Electroplaters' Society. At 50 diameters, with no etch.

In a word, the best known method of assuring a good plate is to use a basis metal with the fewest possible imperfections, and then to avoid introducing any.

New Bearing Bronze Developed by Monarch

A NEW bearing bronze, produced for a wide range of bearing and seal applications, has been developed by the Monarch Alloys Co., Ravenna, Ohio.

Known as Monarch Metal, the new bronze is alloyed in various high-lead combinations. Its elements are combined in a hermetically sealed crucible which protects them from contact with furnace gases or oxygen while they are melting, and the resultant alloy is water cooled by means of a proprietary process.

The results claimed are as follows:

The bearings will run with very little friction, heat and noise. This is due to the fact that hard, abrasive tin and lead oxides are prevented in the melting and casting process.

Monarch Metal is very heat resistant. The cooling process used in its manufacture causes excellent dispersion and nodulation of lead, and consequently the lead will not flow under heat. The bearings will not seize or gall their shaft, even in the case of lubrication failure.

Though the lead content is unusually high, tests show them to have very high hardness and compression resistance.

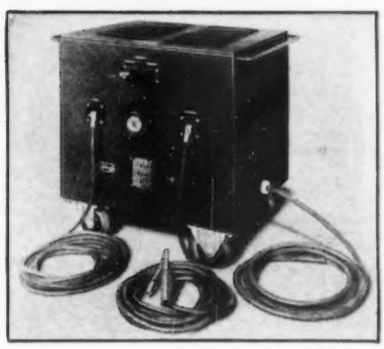
Due to the high lead content and the method by which the lead is nodulated in the alloy, the bearings are easy to break in when new. Most bearings should be broken in with a graphite solution which prevents their galling and seizing. No graphite solution is necessary with bearings made of this new metal.

New Equipment . . . .

Welding Apparatus

New arc welders, a.c. and d.c.; spot welders, rocker arm and long horn type; switches, timers, pressure meters, controllers, welding rods and electrodes, and gas cutters. Some new developments along these lines are here described.

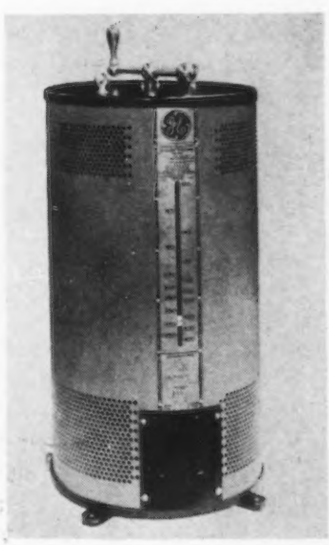
TO their line of low current electronic arc welders, *Allis-Chalmers Mfg. Co.*, Milwaukee, has added a junior model. The new Weld-O-Tron has a current range between 5 and 40 amp. instead of 5 and 75 amp. of the standard model. It is especially designed for those plants already equipped with motor-generator welders that handle currents as low as 35 to 40 amp. Electrodes used are as



small as 1/32 and 1/64 in. in diameter, and the apparatus is well suited for the welding of gage sizes from Nos. 32 to 14. This portable lightweight junior size, Weld-O-Tron arc welder consists essentially of a three tube polyphase mercury vapor rectifier circuit—eliminating all rotating parts and combining all the advantages of a.c. and d.c. arc welding. Controls and terminals are located on the front panel and consist of a two-way switch for changing the polarity of the output terminals. A handwheel provides fine adjustment of the welding current. According to the makers, the constant current characteristic of its larger unit has also been given to the Junior Weld-O-Tron, making the arc easy to start, easy to hold and producing optimum heat condition at the weld.

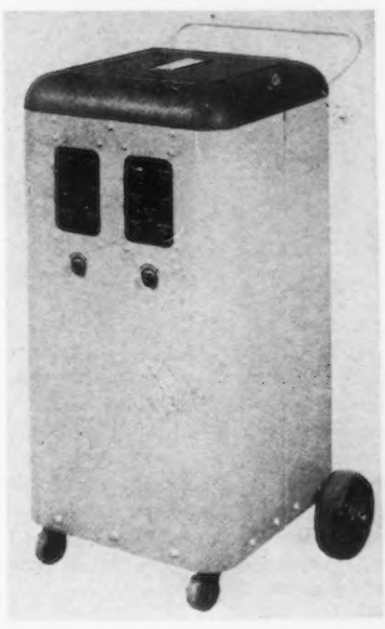
Arc Welders With High Power-Factor

TWO new lines of a.c. arc welders have been announced by the *General Electric Co.*, Schenectady, N. Y., one of 500 and one of 300 amp. These offer advantages in performance and economy resulting from mechanical improvement and a new electrical design which makes possible a greatly increased power-factor, practically eliminating the useless lagging current drawn by conventional designs. Hence, smaller primary cable, line switches and fuses can be used. This often results in a saving on installation costs and makes possible the addition of more welders to existing feeders without causing overload. Any tendency toward an unbalanced load is reduced by one-third. Other advantages offered by these new G-E arc welders include easy adjustment by means of a current changing crank; an easily read current indicator at the side of the transformer case; protected output terminals; and fan forced ventilation for dependable operation at high currents or heavy duty cycles. This improvement in design permits a reduction in size and in weight and floor-space requirements. The units are 43 in. high and 21 in. diameter. The 500 amp. model weighs 600 lb. and the 300 amp. 450 lb.



Continuous Duty Arc Welder

FOR continuous duty the *Greyhound Electric Mfg. Co., Inc.*, of Brooklyn, announces a new industrial 300 amp. a.c. arc welder. This model with 28 heat stages and 18 x 18 x 30

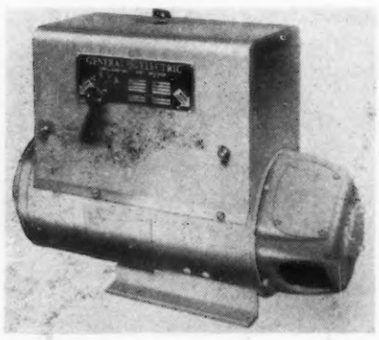


in. size has been designed for welding of 20-gage metal and heavier. Because of the excellent stability of arc, the new instrument may be used for both horizontal and vertical welding on light and heavy metals without blowing. Greyhound welders are manufactured with double windings in the transformers, and a separate reactance. The transformers are wound with

asbestos and woven spun glass insulation. The oversize silicon steel core insures against overheating. The open voltage is 60 to 90 volts and changes automatically on the various amperage taps. This adaptability not only gives ideal welding flexibility of arc, but is most economical, time saving and efficient. Five models are available in a range from 15 to 100 up to 15 to 300 amp.

D.C. Arc Welder

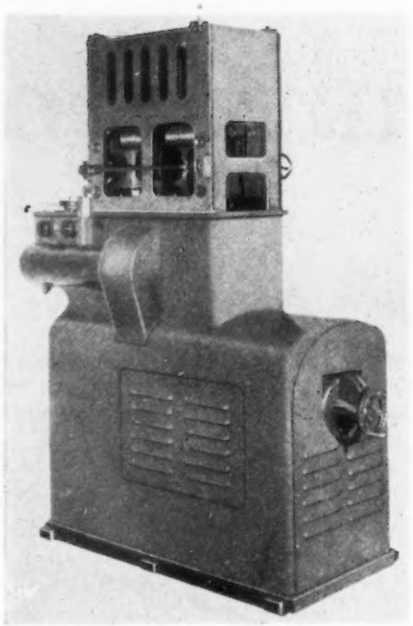
ANY welding current from 25 to 250 amp. can be provided by the new *General Electric* 200 amp. d.c. arc welder. This wide range allows all-day manual welding with currents up to 200 amp., using electrodes from 1/16 to 3/16 in. in diameter. Capacity is also provided for the use of electrodes as large as ¼ in. on occasional short jobs. New arc welder provides for instant recovery of the voltage after each short circuit, preventing arc pop-outs, and also by controlling current peaks it prevents excessive heat and spatter. This feature is made possible by a split-pole, cross-field design. The welder incorporates excellent commutation, iso-thermic overload



protection for the motor and self-excitation. Furthermore, it features quick adjustment of welding current. Self-sealed ball bearings are used. An improved, highly efficient ventilating system prevents overheating even when operating over an extended period. A full range current adjustment results in a saving of 10 to 15 per cent of power costs without current resistor.

Welding Rod Hopper Feeding Machine

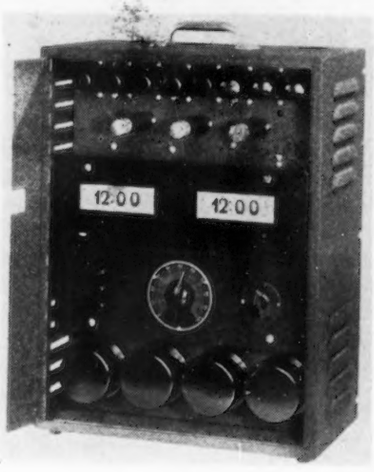
JUST released to the trade, a welding rod hopper feeding machine is announced by *Moslo Machinery Inc.*, 5005 Euclid Avenue, Cleveland. Prime purpose of the feeder is to pass straightened and cut wires or rods into an extrusion press for application of coating material to welding rods. Ca-



pacity of the steel plate hopper is about 500 lb. of wire rods. Adjustable guide plates of feeding mechanism assure uninterrupted flow of wire rods of all diameters. A Reeves drive permits absolute matching of feeding speed with the extrusion press. Feed pressure is maintained through a heavy duty spring and feed mechanism is positive and accurate, adjustment of wire guide tubes being always maintained. This feeding machine is supplied in three sizes to take wire lengths, 18, 24 or 36 in. Right or left operation and feeding height of the apparatus are adjusted to consumer's requirements.

Monitor Control for Arc Welding

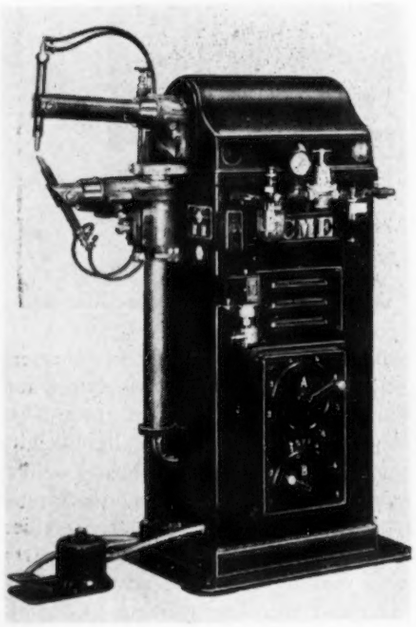
AN inspector for arc welding has been brought out by the *Harris Calorific Co.* of Cleveland. The so-called Master Mind has three lights: amber shines when operator is welding, green when welding properly



and red when at fault. The red and green lights are connected with clocks, which show the number of minutes and hours of proper or improper welding. The total is the actual welding time. Connected to the electrodes of the arc welder the device measures the length and quality of the arc. When the electrodes are pulled away too far by the operator, the globules become a mist and the weld loses quality; then the red light shows. For the only adjustment the supervisor sets a control inside the box for high, low or medium test. Box is roughly 13 x 17 x 7.5 in. It can be attached to as many as 19 arc welding machines at once. In effect the supervisor can "tune in" on any station he desires. The timers may be on the face of the box, concealed under the cover or in a separate unit on top of the box. The device is valuable for testing or training new employees. Thus it tends to improve the quality of work.

Rocker Arm Spot Welder

AIR operated rocker arm spot welders are announced by the *Acme Electric Welder Co.*, Huntington Park, Cal. These spot welders range from



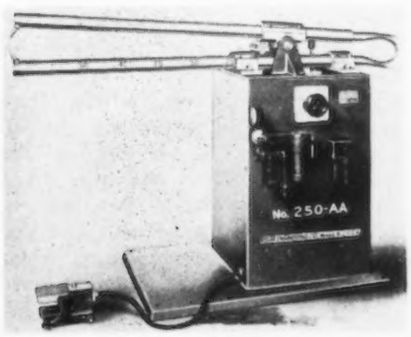
10 to 75 kva transformer capacity and are completely equipped with automatic weld timers and welder service magnetic contactors. They are offered in various styles actuated by foot valve and limit switch, by a mushroom type floor, or by a toe switch. The welders are available in either single spot nonbeat or automatic repeat operation. Advantages offered by air operated spot welders are faster production,

uniform spot welds and reduction of operator fatigue. Heat regulation ranges from eight to 48 points.

Also brought out by *Acme* are rocker arm type hot spot welders in a transformer capacity range from 20 to 50 kva. Horns are double and reversible and one electrode may be turned through an angle of 90 deg. For more difficult welding operations, the lower horn holder is mounted on a column and may be adjusted. All these welders are built for 24-hour service.

Long Horn Spot Welder

LONG horn spot welder for deep sheet metal work is being produced by the *Eisler Engineering Co.*, of 740 South 13th St., Newark, N. J. The new feature in this machine is that both upper and lower horns can be lengthened or shortened to meet



the requirements of the size and type of work. The new horn adjustment makes it possible to weld light and heavy work and deep metal parts. The markings of the horn represent and measure kva. ratings. Cooling water is guided through the entire horn, which can be 30, 36 or 40 in. in length. Eisler spot welders are made for foot, air or motor operation, and will weld up to 150 spots per min. The model illustrated is 25 to 50 kva. air operated, but there are also 5 to 25 and 40 to 75 kva. models.

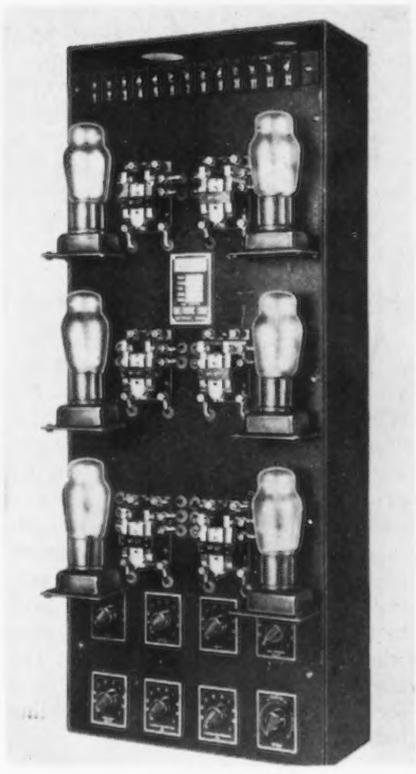
Press Spot and Projection Welders

DIRECT action air operated press type spot and projection welders are announced by *Acme Electric Welder Co.* These are manufactured in transformer capacities from 30 to 150 kva. Throat depth varies and also heat regulation from eight to 32 steps as desired. Machines are fitted with water-cooling of secondary, column and electrodes, universal double and reversible horns, positive locking type heat regulating switch, also piston packed mirror ground air cylinder

cushioned on both the up and down stroke, and complete air equipment, including air filter.

Electronic Timer

DESIGNED and built by *Weltronic Corp.*, 2832 East Grand Boulevard, Detroit, the timer is capable of providing accurate time control for various sequences in welding operation, particularly during the spot welding of heavy iron and steel sections. Low weld current, high weld

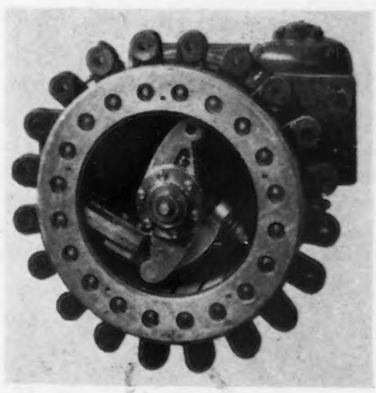


current, initial welding pressure, impact forging, welding pressure, cool time, hold time, etc., all these variables are controlled in respect to time by the instrument. Any combination of these factors can be regulated accurately. Eight rapid selective type control knobs permit the welding supervisor to adjust the variables.

The same company has further developed a new timer contactor Model 108-53 to eliminate the skill required in timing hand operated welds and to assure uniformity. It can be used with any 15 to 35 kva. spot welder and is available for 220, 440 and 550 welding voltages and for 25, 40, 50 or 60 cycles frequency. The apparatus is adjustable over a range of timing from 2 to 30 cycles. Two control knobs provide close adjustment to suit the work being welded. Contacts are quickly removable for replacement and entire unit can be readily serviced. It consists of an electronic tube, relay and magnetic contactor enclosed in a spring hinge cover case.

Multi-Point Welding Switch

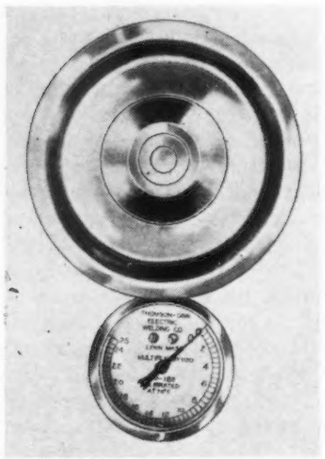
RECENTLY developed by *Taylor-Winfield Corp.*, Warren, Ohio, is a rotary switch for its Ultraspeed multi-point spot welding machine. The main distributer ring is located immediately behind an internal commutator ring



and distribution of current is made from the former to the latter by means of a rotating brush made of laminated silver plated copper. Brush is driven by a motor through a worm gear reducer and Geneva motion, thus indexing the brush from one segment to another. The weld is made successively while the brush is stationary on a commutator section, eliminating the transmission of heavy welding current while the brush is in motion as was the case in the reciprocating contact used in earlier Ultraspeed models. Cam operated limit switches initiate the welding timer and also stop the motor after one complete cycle.

Improved Pressure Meter

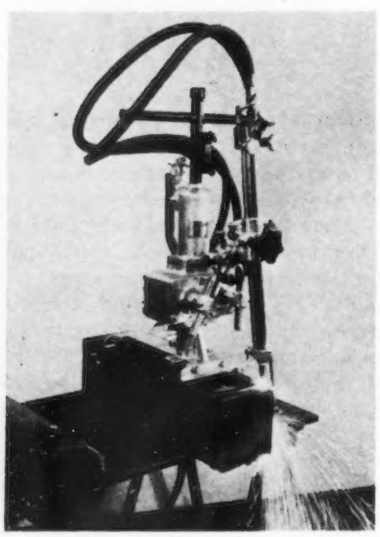
IMPORTANT improvements in the Thomson resistance welding pressure meter insure more lasting accuracy. The meter, a product of the *Thomson-Gibb Electric Welding Co.*,



Lynn, Mass., consists of an oil-filled diaphragm connected to a gage made with a bronze bushed movement. Each gage is individually and carefully calibrated to read directly in pounds. A plunger tube plug stabilizer in the stem protects the gage against damage from sudden applications of pressure. The diaphragm unit is resistance welded throughout and this construction results in a strong and reliable unit.

Oxy-Acetylene Bar Cutting Machine

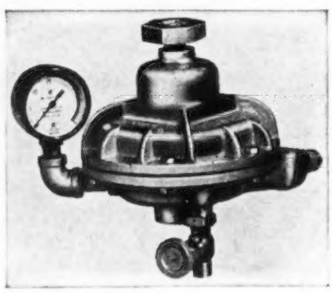
FOR a number of steel mill cut-off operations a new oxy-acetylene bar cutting machine has been designed by the *Linde Air Products Co.*, a unit of the Union Carbide & Carbon Corp., of 30 East 42nd Street, New York.



This Oxweld CM-35 bar-cutting machine cuts rounds and squares with a minimum of adjustments and is driven by a self-contained spring-power unit, the speed of which is hydraulically controlled. The apparatus is simple in operation, motion for cutting either round or squares being transmitted positively to the blowpipe by an adjustable linkage mechanism. Hydraulic control provides smooth blowpipe travel with an infinite variation of cutting speeds between 1 and 75 in. per min. The gas cutter is readily transportable. With standard equipment it has a cutting range from 2 to 10 in., but this can be increased to 8 to 15 in., by means of special linkage arms.

Regulator for Acetylene Generators

USERS of acetylene generators will be interested in a new development brought out by the *Sight Feed Generator Co.*, Richmond, Ind. This is a two stage regulator for generator use. It eliminates the disad-



vantages of the usual line regulator and fits in the outlet valve opening. The large diaphragm assures even pressure at all times. The regulator is usually furnished with one service outlet valve, but it can be fitted for two valves and may be used with a pipe line system.

New Flux for Bronze Welding Rods

AN outstanding new high-test flux-coated bronze welding rod has recently been announced by *Air Reduction*, 60 East 42nd Street, New York. It is said to offer eight outstanding advantages: Low fuming, faster application, denser deposit, increased tensile strength, greater bond strength, increased hardness of deposit, materially improved ductility and time saving in operation. Flux adheres well to the rod and will not fall off, even when the rod is excessively bent. The same flux is available in paste form for those who prefer a bare welding rod.

Welding Helmet

A WELDING helmet from which the glass can be removed and inserted from the outside and with head band that may be adjusted on

the head without removing gloves is announced by the *Boyer Campbell Co.*, 6540 Antoine Street, Detroit. The glass is held in a non-metallic holder that has a slot in one end. A flat bowed spring between the inner cover and filter glass holds the complete assembly within the helmet. The slot is inside of the helmet except when the holder is moved outward just enough to allow the glass to be inserted through the slot from the outside.

Welding Gloves

NO seams are exposed to wear in the chrome tan horsehide welding glove being offered by *American Optical Co.*, Southbridge, Mass. All seams are at back of fingers, except at base of second and third fingers and these latter seams are welt reinforced. Thumb and index finger are also reinforced. Inside is insulated with wool. Model 3015, also newly introduced, is similar to TX100 except that back of glove is not one piece construction.

Skin Protector

PROTECTION of welder's hands and chest from effect of ultra-violet and infra-red rays encountered in welding operations when flashes occur, is claimed for Ply No. 8, a vanishing cream which is applied by rubbing into the skin, introduced by *Milburn Co.*, 905 Henry Street, Detroit.

The spindles of Milwaukee Vertical Milling Machines have the same powerful drive as those of the horizontal models . . . with the spindle gears mounted solidly on the spindle. Thus power is delivered to the spindle through low torque, high speed shafts.

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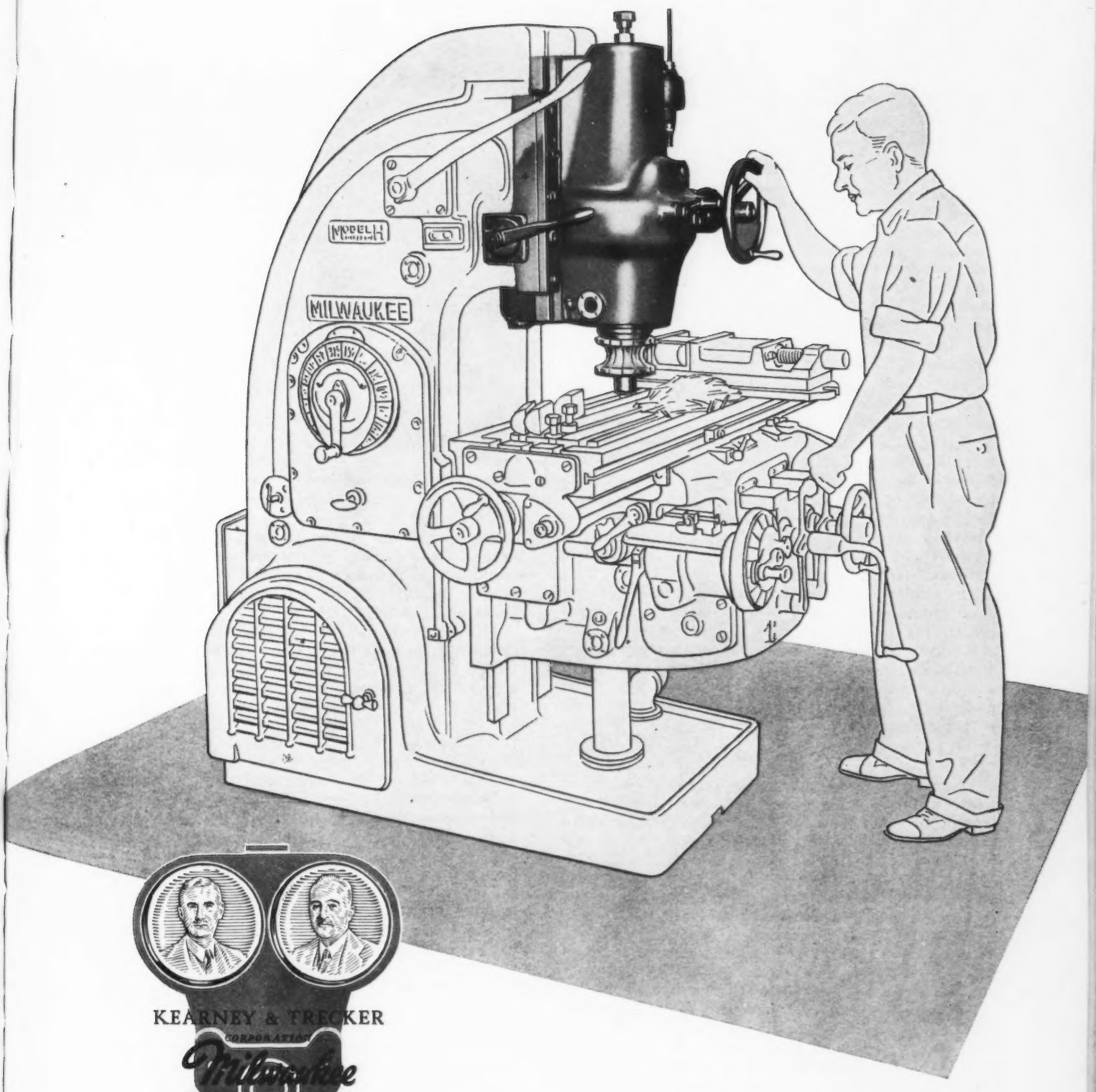

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MILWAUKEE MILLING MACHINES

On The Assembly Line

BY W. F. SHERMAN
Detroit Editor

• Ford starts production of a six-cylinder car . . . About 25,000 engines scheduled for first quarter . . . Military transport vehicles due to undergo important basic changes . . . Automobile assemblies continue at a high weekly figure.

DETROIT — Ford's six-cylinder engine went into production last week in a surprise move that indicates probable announcement of this car within the next four to six weeks.

The Ford six, so often predicted in the past that many have lost faith in the prediction, actually was built during the past week in small quantities, with the total production for the week approaching the hundred mark. Between 400 and 500 of the engines are scheduled for production during the current week and 800 or 900 will be built next week. The schedule, thereafter, will be stepped up to 1800-2000 in the week of Jan. 6 and 3000 engines are scheduled for the week of Jan. 13. Eventual output of as many as 600 per day is indicated by parts delivery schedules. Commitments for 25,000 six-cylinder engines have been made. Since Ford is currently completing commitments for first-quarter requirements on other cars and trucks, it is believed that the 25,000 engines will be assembled in the first quarter.

The engine is a conventional looking L-head type, developing about 85 hp. It will go in the regular Ford chassis, not in a special car.

It will be recalled that in September the Ford dealer-distributor set-up was altered to separate the Mercury and Lincoln-Zephyr lines from the Ford V-8. It is understood that now the six will be handled along with the V-8.

5300 Engines per Day

There has been speculation in recent weeks about whether Ford would produce the six in January, although for several months that has been the indicated course. It was questioned, for instance, whether this was a propitious time to announce a new model, although with sales totals rolling up every week there seemed every reason to believe that another model would find buyers. However, the industry as a whole is beset by so many uncertainties because of the defense program that it seemed like a fair assumption to believe that the six had been quietly dropped. Not a whisper was heard about it for many weeks.

The projected output of 600 engines a day—3000 a week—will not make much of a dent in Ford's production of other engines, although there are indications that the V-8 schedule will be trimmed somewhat. However, all the Ford engine output has been aimed at the target of 5300 per day, so the output of the six will only be a small percentage of the total.

Tooling problems were not involved at this time since Ford long ago prepared for the production of this engine.

There is no indication so far of price differential between the six and the eight, but it is estimated that a $25 differential is at about the right level.

Off and on there have been rumors and public announcements of engines made from sheet steel. Usually these have been characterized as "crackpot inventions" and dismissed from mind. Commonly this type of engine was referred to as the "tin-can engine." However, it has been conceded that there are possibilities in the fabrication of important parts of the engine from sheet steel. Now it is understood that the recently organized Tucker Aircraft Corp. is actually making up some engines with the crankcase made of spot-welded stainless steel of moderately heavy gage. The engine, said to have been designed by Harry Miller, noted designer of racing engines, is a V-12 type engine with reasonably short crankshaft. The crankshaft is mentioned because lenght of shaft, hence length of crankcase, is an engineering consideration. A long flexible engine would weave around so much as to be impractical.

Military transport vehicles are due to undergo some important basic changes as a result of wider experience with present trucks in the field, according to some of the engineers who have been intimately connected with their design, manufacture and use.

At least one of the major automobile manufacturers now supplying Army trucks is already engaged in designing a new vehicle on the basis of experience gained in the field in recent months. The new design is being carried forward rapidly despite the fact the deliveries on the original order are only half complete and are being made currently on the remainder.

Lest anyone jump to the conclusion that the new design is necessitated by unsuccessful performance of the present line of trucks, it should be understood that this organization and others, undoubtedly, are merely working out an "optimum" future model along a pattern which approximates the yearly procedure in the industry of starting work on next year's model as soon as this year's is in production.

Lack of Standardization a Problem

However, even though the present lines of trucks have not proved unsuccessful—by which we mean entirely unsuited to military operations—there have been numerous important objections on two points. First, the trucks are converted commercial vehicles which, in turn, are in some instances merely glorified

ACCURACY . . .

a 1940 Must for increased output

With national security at stake, American industry must now more than ever produce rapidly, efficiently, smoothly . . . *in every small detail of the operations which make up big jobs.* Among a multitude of products and services through which Pratt & Whitney is assisting the national effort are two contributions particularly concerning *tapping:*

A. ***Advisory Service.*** When you send us your tap order for a job that's *new* to you—involving unfamiliar alloys, unusual cutting conditions, or whatever—give us full details of the operation planned. P&W tool engineers can save your time and money by helping you select the precise combination of size, shape, rake angle, heat treatment and all the other variables of the simplest tap which affect tapping efficiency.

B. ***Uniform Taps.*** Regular P&W tap customers know it's our special pride to produce taps *identical* in performance, batch after batch . . . taps that cut the same, clean, *accurate* threads.

P&W taps—*accurately* selected, *accurately* produced—are a 1940 *must* for American industry.

PRATT & WHITNEY
Division Niles-Bement-Pond Company
WEST HARTFORD, CONNECTICUT

PRATT & WHITNEY TAPS

passenger car engines, etc., assembled into a truck. Second, lack of standardization has taken its toll already in military maneuvers; engineers and operating men with past experience in this sort of thing predict that lack of standardization might prove fatal to any large-scale emergency maneuvers.

Already instances to support these claims have arisen. In major Army maneuvers last year, for instance, there was difficulty because battery sizes were not uniform. Even though two one-ton trucks made by different companies bear a general resemblance to one another, there is usually no standardization on the outside dimensions of the battery case, although battery capacities may be identical. In October, when a convoy of approximately 300 trucks of various makes was used to transport the National Guard from Michigan to Louisiana and Texas, front page newspaper articles said, "more than 50 per cent of the vehicles had given trouble—sprung frames, batteries, fan belts, etc."—"reported that all Army trucks of the future will have one type battery in place of nine—three fan belt types in place of 21."

Lack of standardization is further emphasized by knowledge of the fact that not even the wiring harness is interchangeable on the various trucks being made in the neighborhood of Detroit now. There is no way of interchanging equipment of this sort on Ford, Chevrolet or Dodge vehicles, to be specific.

It may be claimed that under actual field conditions each military outfit would have just one type of truck to use in service. Those with experience say that equipment gets mixed up too readily to rely on any such hope as this. These interested engineers can cite many instances where a single truck of one make has tied up a procession of other trucks because a replacement part could not be provided in the field, although the replacement may have been such a minor item as distributor points.

Since many of the manufacturers of military vehicles are, we believe, engaged in the general redesign of current models—or are projecting new models to come later—it is timely to suggest a coordinated design standardized on the same basis as the Class B military truck, or Liberty truck, of World War I.

No Bar in Canada on Imports of Trucks

Trucks and commercial vehicles can be imported into Canada under special license. Contrary to the inference contained in the first paragraph of last week's Assembly Line, there is no indication that the special Canadian excise taxes will be applied to commercial vehicles necessary in Canada.

Automobile production of current passenger cars and trucks continues at the year's highest levels with 125,370 assembled during the past week, compared with 125,625 in the previous week and 117,705 in the corresponding week of last year, according to Ward's Automotive Reports.

Allison Given Engine Contract of $69,722,625

Washington

• • • **The Allison** Engineering Co., a division of the General Motors Corp., has been awarded a $69,722,625 airplane engine contract by the War Department. This is the next to largest award of the kind ever made in the automotive industry. It is exceeded only by the Ford Motor Co. contract, amounting to $122,000,000.

The War Department also has made a $5,210,000 agreement with the Republic Aviation Corp., Farmingdale, N. Y., for plant expansion.

The plant will be utilized to construct the major portion of the airplanes called for by Republic's contracts to build more than $60,000,000 worth of pursuit-interceptors for the United States Army Air Corps. The existing building also is being used for Government work.

"We have under way a program to train thousands of new employees in order to obtain the manpower for the new plant," said W. Wallace Kellett, president of Republic. "This program, by which men are given cost-free tuition in a top-ranking aircraft vocational school, will cost Republic approximately $1,000,000, but will assure a reservoir of trained help as needed."

$36 Millions in Plant Orders to Grumman

Washington

• • • The Navy Department has awarded two contracts to the Grumman Aircraft Engineering Corp., Bethpage, L. I., one for airplanes and spare parts to cost $30,275,805, and the other for airplanes alone, to cost $5,974,650.

Machine Tool Activity Rate Climbs to 95.4%

Cleveland

• • • **During November the** machine tool industry's operating activity measured in terms of payroll hours was 95.4 per cent of the capacity reported, according to the latest report of the National Machine Tool Builders Association. Capacity increased 3 per cent over October, bringing the accumulated increase to 54.9 per cent over September, 1939.

"Outside" Auto Stampings Output at $47 Million

Washington

• • • **The 1939 output** of automobile stampings not made in the motor vehicles, motor vehicle bodies, parts and accessories industry, was valued at $47,833,155, a decrease of 39.4 per cent compared with $78,920,906 reported for 1937, according to the Bureau of the Census.

G-E Plans $400,000 Plastics Expansion

Pittsfield, Mass.

• • • **Plans for the** expenditure of approximately $400,000 for expansion of the eastern facilities of the plastics department of the General Electric Co. have been announced by G. H. Shill, manager of the department. The expansion will include new buildings and equipment in Pittsfield, Mass., and at Meriden, Conn., and additional equipment in the Lynn, Mass., plant.

How to get

MORE PRODUCTION

from present equipment

There are two ways — faster speeds — or fewer interruptions.

Ten to one, you've checked on the speed question — but what about interruptions? Particularly interruptions caused by poor tool performance?

Every time a machine or press must be shut down to "touch up" the tools, regrind or replace them, it cuts down your production, upsets schedules and jacks up unit costs.

Frequent shut-downs on this account are an indication that tools and dies are falling short of the job, and tying knots in your production capacity.

By improving the performance of your tools, you can wipe out this production handicap. Carpenter Matched Tool Steels will help you do it. Send for booklet that shows how to insure better tool performance with the modern methods that are fast becoming standard practice in plants like yours.

THE CARPENTER STEEL CO. • Reading, Pa.

On this job of blanking and forming brass rotary contacts — a Carpenter Matched Tool Steel stopped die breakage and saved *five* shutdowns on 100,000 run.

Carpenter MATCHED TOOL STEELS

FREE New Booklet Shows How To Get More Production From Present Equipment . . .

THE CARPENTER STEEL CO.
121 W. Bern St., Reading, Pa.

Without obligation, send me your new illustrated booklet that shows how to increase output per machine.

PLEASE PRINT

Name_____ Title_____

Firm_____
(Firm Name Must Be Given)

Address_____

City_____ State_____

Washington

BY L. W. MOFFETT
Washington Editor

• Knudsen sends contract assurances to encourage machine tool plant expansions . . . President's plan for "leasing" arms to Britain to be debated . . . War department studying tool requirements, to ration them to most important industries.

WASHINGTON — Designed as a part of "an effort to break the machine tool bottleneck," whose seriousness has been emphasized by William S Knudsen, the War Department has issued "letters of intent" —assurances that contracts will be awarded —to three machine tool builders authorizing plant expansions, and said that similar letters to other companies will be issued.

While the number of additional letters to be sent out was not made known, it was pointed out that it might be large since approximately 150 companies were appealed to by Mr. Knudsen in letters of Dec. 9 asking them "to do the impossible again" because of "the terrible urgency of the situation" by speeding up delivery and increasing production. The three companies getting the letters of intent were Giddings & Lewis, Fond du Lac, Wis., manufacturers of horizontal boring machines and milling machines; the Bullard Machine Co., Bridgeport, Conn., builders of vertical turret lathes, and the Bryant Chucking Grinder Co., Springfield, Vt., makers of internal grinding machines.

In a study of defense manufacturing facilities the War Department is giving especial attention to machine tool requirements with a view to rationing them to the most important industries under the direction of the Machine Tool Priority Committee of the National Defense Advisory Commission. The study has been undertaken to bring up to date information on the country's productive possibilities that the department has been gathering for 20 years.

Defense Orders Must Be Accepted

It is clearly the opinion of the defense commission that there is capacity covered in the War Department survey that is not now but can be engaged on defense requirements. It is contended that this situation is due to the unwillingness of some producers to accept additional orders under the claim that they are already fully occupied on previous contracts. An effort will be made to overcome this reluctance. The government, of course, can demand that defense orders be accepted. In case of refusal to do so, the President can "draft" and operate the plants. The President has said that to date there has been no occasion to invoke the "draft industry" amendment, but that two or three plants are under investigation.

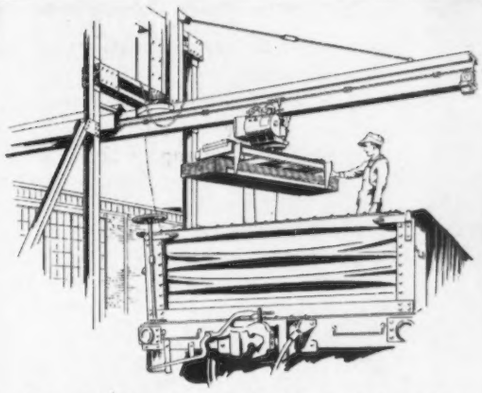
He made this observation at the same time he disclosed his sweeping plan to have the United States government take over future British orders, finance production and rent or lease the equipment to Great Britain, payment to be made in kind. Boiled down this is taken to mean that the United States will pay the cost of British orders hereafter, since payment in kind, if the term is to be taken literally, would not be desirable. The President's plan will require Congressional approval and undoubtedly will be hotly debated in both the Senate and the House at the forthcoming session. Nevertheless Congressional approval of the plan is predicted.

Future British orders placed in the United States cannot possibly be estimated with any degree of accuracy, but rough calculations place the total at $3,000,000,000. They are definitely in the picture in connection with the plan to more fully engage both large and small manufacturing facilities on defense requirements.

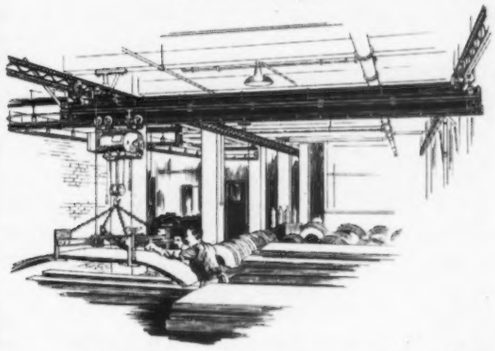
It is said that some producers maintain they are unable to accept new orders that are not in accord with "accepted schedules of production" that they have signed in connection with the War Department's advanced procurement program. This creates another so-called "bottleneck," and efforts to eliminate it by a discussion of the situation are being made. The official attitude, as reflected by Assistant Secretary of War Robert P. Patterson, is that evidence of the willingness and ability of the manufacturers to cooperate in the defense program is shown by the fact that they have signed the "accepted schedules of production." These schedules, he has said, are not to interfere with old defense orders and are not binding on either the producer or the government. A similar position has been taken by Donald M. Nelson, Defense Commission Coordinator of Purchases. He has stated that orders already placed will be given adequate consideration when new orders are distributed. He regards all defense orders, whether or not they cover products originally scheduled, as part of the entire defense program, and that the capacity available, as shown by the War Department survey, has been taken into calculation.

Priorities Being Subdivided

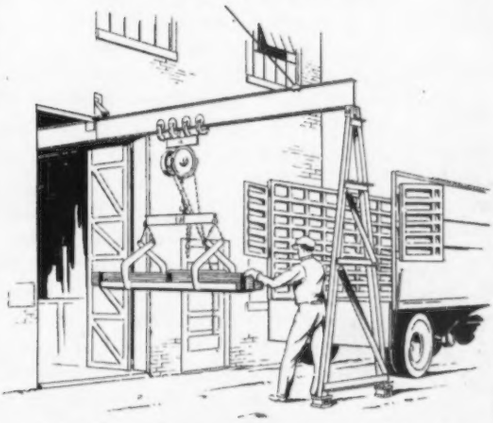
Although the priorities committee of the Army and Navy Munitions Board had indicated almost two months ago that the A-1 preference classification would be subdivided into six sections, beginning with A-1-A, A-1-B, etc., because most defense contracts were being classified then as A-1, it is only within the last week that local dealers have encountered a subclassification of A-1, namely an A-1-B



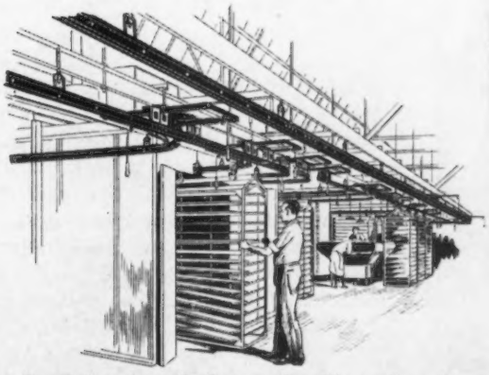
3-ton bundles of steel sheets unloaded quickly without damage.



Crane interlocks with spur tracks for safe movement of stock.



Retractible crane reduces cost of unloading steel from trucks.



Special racks eliminate rehandling of parts through baking process.

Save your Man-Power!

Skilled labor is expensive. Why waste it in handling operations. A simple overhead monorail system to perform the "lift" and "Carry" jobs will show an immediate return in saved man-power.

Standard parts assemble into complete systems to meet special requirements so that American MonoRail engineers are able to solve many problems without excessive cost. Let them survey your requirements at no obligation.

Write for copy of "Blue Book" showing hundreds of installations

AMERICAN MONORAIL

13103 Athens Avenue

CLEVELAND, OHIO

priority. Despite all talk of priorities and the enormous demand for all types of machine tools, some buyers are still laggard in closing outstanding quotations. In some instances deliveries quoted are good only for a matter of hours and sellers are holding strictly to any given deadline.

Orders continue to exceed current shipments, by as much as two and a half times for some leading dealers. Dealers will enter the new year with the biggest backlog on their books in history, even including the period of the World War. Still greater backlogs are a certainty.

Knudsen, Hillman On Super-Defense Board

Washington

• • • **Announced last** Friday by President Roosevelt, a four-man Office for Production Management directed by William S. Knudsen soon will get under way in an effort to revitalize the lagging defense program. The President said that the OPM will be created by executive orders and that it would take about 10 days to prepare them.

While there had been strong pleas for an organization similar to the old War Industries Board under the direction of a single head, President Roosevelt disregarded the suggestion with the contention that under the constitution a "second President" cannot be "set up" so instead he constituted a board representing industry, labor and the military forces. When asked where the balance of power lies in case of disagreement among board members the President said that they will agree unanimously and will not vote. Final authority on board decisions rests with the President.

The board is constituted as follows:

Mr. Knudsen, director and representative of production.

Sidney Hillman, head of CIO's Amalgamated Clothing Workers Union, associate board director and representative of labor.

Secretary of War Henry L. Stimson and Secretary of the Navy Frank Knox, representatives of the armed forces.

The President said that the new "super-defense board," which was superimposed on top of the National Defense Advisory Commission of which Mr. Knudsen and Mr. Hillman are members, has all the responsibility of which the President can divest himself under the constitution. Though the OPM will have full powers, Mr. Roosevelt said, it will not supersede the Army and Navy in the actual signing of contracts. Mr. Roosevelt would not say that setting up of the board will materially speed up defense efforts. He pointed out that there already was a daily speed up.

For his authority to establish the board, the President said he had turned to an unusual section of the First Reorganization Act. This act, he explained, authorizes an emergency office in the White House.

As outlined by the President, the board will operate through three sub-divisions:

A production division of one, two or perhaps three suboffices, in charge of the actual production processes. The President said that such men as Edward R. Stettinius, Jr., member of the defense commission in charge of the Raw Materials Department and John Biggers of Libby-Owens-Ford Glass Co., a deputy commissioner, might serve on this division.

An office for defense purchasing, headed by Donald M. Nelson, Sears, Roebuck & Co., now defense commission Coordinator of Purchases.

A defense priorities board, an existing defense commission organization, consisting of Commissioners Knudsen, Stettinius, Hillman and Leon Henderson.

It is understood that under the new setup, purchases for the United States and for the British will be centralized under Mr. Nelson.

Mr. Hillman's selection as a member of the board to represent labor was said to be due to two outstanding reasons: (1) Because he is already a member of the defense commission as its labor representative, and (2) because CIO represents union labor in the basic industries while the AFL, left out in the cold, does not. Mr. Hillman will virtually rank as high as Mr. Knudsen, despite the title of director to be conferred upon the latter.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

I- UH-I JUST TURNED MY BACK TO LOOK AT TH' DRAWIN', AN' I DON'T KNOW WHAT HAPPENED! IT JUMPED A THREAD, ER TH' DOG SLIPPED, AN' RUINT TH' HULL THREAD!
GOSH--I'D HATE TO SPOIL A JOB NOW WITH ALL THIS FIFTH COLUMN STUFF GOIN' AROUND! A GUY WRECKIN' A JOB THESE DAYS IS AS BAD OFF AS A BEARD AT TH' BORDER!
NO, I DON'T THINK THEY'LL COMB HIM OUT--HE'S WORKED HERE TWENTY YEARS, AND IF TH' ENEMY HAS BEEN PAYIN' HIM THAT LONG TO DO SO LITTLE DAMAGE, WHY, HE'S A BIG HELP TO US!
T. M. REG. U. S. PAT. OFF. COPR. 1940 BY NEA SERVICE, INC.
WAR WORK
12-27
J.R.WILLIAMS

U. S. Buys 100,000 Tons of S. A. Copper

Washington

• • • **Federal Loan** Administrator Jones last Thursday announced that the Metals Reserve Co. had contracted to purchase 100,000 tons of Latin-American copper. Of the total 72,000 tons was purchased from three companies at 10c. per lb., f.a.s. New York on the condition that if at any time the cost of freight and insurance exceeds ½c. per lb., the excess will be borne by the Metals Reserve Co. The three supplying companies are the Anaconda Copper Mining Co., 57,000 tons; the American Metal Co., Ltd., 10,000 tons, and the Phelps Dodge Corp., 5000 tons.

The remaining 28,000 tons of copper was purchased from the Kennecott Copper Corp. at 9½c. per lb., f.a.s. Chilean ports, on the condition that on such portion of this copper as the sellers can furnish transportation for, the Metals Reserve Co. will allow sellers ½c. per lb. for transportation, war and marine insurance, making the total cost on such portion 10c. per lb., f.a.s. New York.

On such portion as the sellers are unable to furnish transportation for, the Metals Reserve Co. will make its own arrangements for transportation at the best rates obtainable.

Rheem Co. Expands For Defense Work

• • • **In anticipation of** additional national defense contracts, the Rheem Mfg. Co., makers of steel barrels and containers, is planning to erect a large addition to its recently completed plant in Sparrows Point, Md. Contracts for the design and construction have been awarded to Brown & Matthews, Inc., engineers and contractors of New York, and work will be started immediately. The Rheem company is at present manufacturing several sizes of fins for demolition bombs in its Chicago plant, and will divert certain operations for some of its products, such as automatic water heaters, range boilers and tanks, to the new plant at Sparrows Point.

War machines and munitions have to be good to stand up under war conditions. They must be made rapidly in huge quantities by a variety of plants. All parts must be strictly interchangeable.

Hence the task of guarding quality becomes a matter of life and death importance to a nation rearming to preserve its liberty.

Sheffield Visual Gages are stalwart guardians of dimensional quality. They are used in checking dimensions of manufactured and purchased parts, tools, production and master gages.

The sturdy Reed Mechanism, combined with the light beam lever arm, provides a sensitivity to meet the highest precision standards of measurement—but without the delicate fragility so often associated with sensitivity.

These gages are not delicate, they are strong and deadly accurate. They are made in various models to check accurately to thousandths, "tenths" or millionths of an inch and all provide rapid, easy gaging to any limits required on production work.

Write for information.

SHEFFIELD
GAGE CORPORATION • DAYTON, OHIO, U.S.A.
MASTER GAGEMAKERS

Fatigue Cracks

BY A.H.DIX

The Case Of The Lost Blue Print

• • • After waiting patiently to have his identification badge made out and successfully running the gauntlet of guards, one of your favorite family journal's advertising representatives finally reached the office of a certain machine tool builder. He spread his wares carefully on the m.t.b.'s desk and was then told, *"Something very important has just come up. Can you come back at four"*

So he gathered up his wares and stuffed them back into his briefcase. When he returned at four he was rushed to the big shot as fast as if he were Bill Knudsen himself. The machine tool builder was agitated. "Open up your bag," he barked, causing our missionary to beam over the rare and happy spectacle of eagerness to hear a sales solicitation. The m.t.b. pounced on a document and said, *"Thank the Lord it's safe! This is an important blue print we just got from Washington. We've been sweating blood ever since you left."*

Our man was so worried about gumming up the defense program that he immediately began assembling his collapsible sword which every IRON AGE representative carries for just such cases, and was preparing to fall on it, when the m.t.b. assuaged his grief by giving him an order for a double-page spread to appear in the Annual Number, and a page once a month thereafter.

Smothered In Flowers

• • • The Annual Number, by the way, which is next week's issue, will tip the 500-page mark. For the past six weeks the Editorial Dept. has been as busy as an arsenal in wartime. The big book will be full of eye-popping surprises, and if we are shortly suffocated with a bombardment of orchids we will just drop our eyes shyly and say, *"It's just what we expected."*

Pungent Pun

• • • Speaking of orchids, we agree with Sam DeWolf that Ray Millholland rates one for this clever line in his Dec. 7 *Satevepost* story:

". . . the difference between a fourflusher and an honest-to-gauge master mechanic."

Bifocal Brigade

• • • We see that the Army has given the Savage Arms Corp. an order for shotguns, which means that you can miscall the big Z at the bottom of the eyetest chart and still get in the infantry.

When Greek Meets

• • • Phil Schmitt writes that in a Long Island train the other night he heard a man trying to persuade a friend to change his name from Dipioli to Dipiopopolis.

Garden Notes

• • • Our search for a word to rhyme with *aluminium*, as an alternate line for Ethel Merman's *"All the same, I'm in the pink, my constitution's made of zinc."* has been ended by G. F. Murray and Dwight (Duriron) Spofford. Coincidentally, both hit upon the same word.

Mr. Murray offers *"All the same, my name's Delphinium, my constitution's aluminium,"* and Mr. Spofford, *"All the same, I'm no delphinium, my constitution's aluminium."* We are not overpleased with these solutions, fearing that they lack the proper intestinal note, but as this is the season of tolerance and goodwill, we accept them grudgingly.

Harelip Effect

• • • Our distaste for reading the letters we dictate caused us to send out one the other day referring to the Annual Number as our *"price and job,"* instead of our *"pride and joy."*

Maybe a psychiatrist can make something out of it. And while he is at it he might take a crack at the following in a letter from Bill ("On the Assembly Line," see p. 50) Sherman, our Detroit editor, who graciously keeps us in touch with new and unusual terms used in the industry, and who, like us, proofreads his letters by the hop, skip and jump method:

> "Vogie—from Col. Vogie, a mythical character referred to in games, to whom a fixed score is attributed. The players compete against the vogie. Hence, a spare, an idle member. The vogie wheels on a tank are those inside the caterpillar treads which do no driving, merely going along for the ride, so to speak."

Thanks, Vill.

For Iron Constitutions

• • • Another member of the staff, Bill Hoffman, was astonished to find the following listed in the new Cincinnati classified telephone directory under "Ornamental Iron Work:"

Hunter, Leon G., General Practice & Rectal Diseases
Kersting, Geo. H., General Practice and Rheumatic Conditions
Kratz, J. Collin, Nervous Diseases

He checked up and found that the printer had the ornamental iron workers mixed up with the osteopaths.

O. K. Buddy

• • • Ever since our $60 flyer in Calumet Copper made a forced landing back in the days when SEC meant dry, our dealings with brokerage houses have been slight and our belief in their prescience has mounted. Somehow we have felt that they had sources of information closed to the layman, and that they could, for instance, grab the telephone and get the lowdown on Chrysler fourth quarter earnings simply by asking, *"Hutch, how do things look?"* and that they had a pipeline to the order desk of Allied Dye & Chemical.

This impression has been created by the brokerage houses' air of urbane austerity, their use of embossed letterheads, and their practice of signing letters with names parted in the middle, like H. Wellington Jones. But an ominous note is creeping in. A letter has just come in from a brokerage house signed "Bill . . . " We decry this and think that Steps Should Be Taken.

Aptronym

• • • *D. R. Clarkson writes that Kenmore, N. Y., has an undertaker named George A. Bury.*

Cheesecake Ascendant

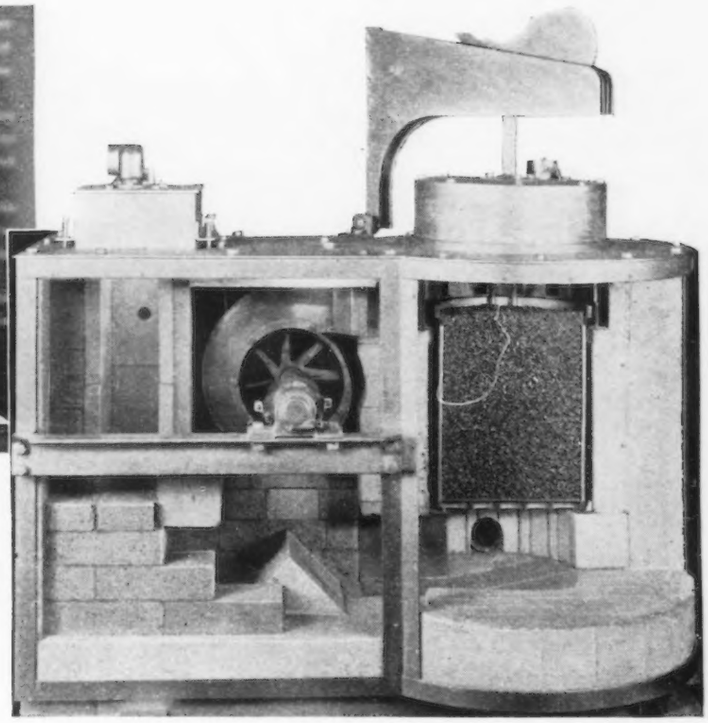
• • • *Despite Percy Hammond's dictum that a knee is a joint and not an entertainment, a survey made among commercial illustrators shows that leg art is increasing in popularity—helped along no doubt by a New York City firm named the Exposed Publishing Co.*

Puzzles

The Dec. 12 problem was a trifle to the master minds, including H. Kelsea Moore, Jr., Richard M. Machol and W. E. Voronovich.

If you answer the following by mental reflex, or in seven seconds at the most, your carburetor points are adjusted for winter starting:

If the weight of a brick equals 10 lb. plus a half brick, how much do 1½ bricks weigh?



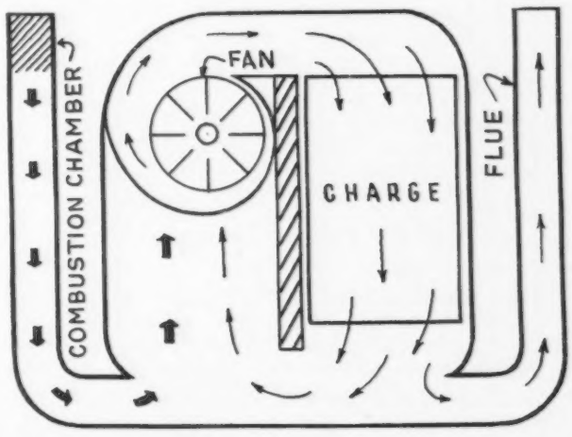
"Just what is this CYCLONE PRINCIPLE used in Lindberg Furnaces"

REMEMBER the old grocery store back in the home town,—how in the winter you used to edge up to that big stove and almost roast your back side while the rest of you darn near froze? Now contrast this with the theater you went to last night. You felt warm all over,—yet there was no heat actually created in the room. It was probably generated in a heating plant way down below the stage and blown up and out into the auditorium through numerous vents.

Now let's substitute a Cyclone tempering furnace for the theater. For the audience we'll substitute a charge of 3/8 inch number six self tapping screws. If we place this charge of screws in the Cyclone furnace where the heat is accurately generated in a separate chamber *away* from the charge, and then driven under high pressure and at a two mile a minute velocity into every part of the chamber carrying these screws, we can be sure that all will be quickly heated to exactly the same temperature.

Just as the modern heating plant in the theater kept you warm not just on one side, but all over, so the unique Cyclone forced convection heating principle brings all parts of the charge to uniform temperature, turning out work within most exacting hardness tolerances. This speeds production by eliminating rejections and the necessity of retempering due to poor hardness uniformity. Startling cost reductions often exceeding 50% result from savings effected by reduced fuel consumption, not to mention additional economies resulting from the saving of time formerly spent in washing oil quenched work, and the absence of frequent maintenance or repair shut downs. In these times of far-above-capacity-production these points are really important to you. Many Cyclones have been known to show a complete return on the investment within 6 or 7 months.

Special bulletins giving a more detailed explanation of the Cyclone principle are available on request. Lindberg Engineering Company, 228 North Laflin Street, Chicago.



LOOK TO LINDBERG FOR ACCURACY

LINDBERG FURNACES

CYCLONE FOR TEMPERING • HYDRYZING FOR HARDENING

News of Industry . . .

Machine Tool Men Say Knudsen Will Get Still Greater Production

• • • **Machine tool builders** of the country are convinced that Defence Commissioner William S. Knudsen's "terrible urgency" appeal for more machine tools can be met if certain procedures are followed.

First, it is pointed out that the industry does not know specifically just how many tools of each type, beyond those now on order, will be needed, and until they have that precise information they can plan only on a somewhat "hit or miss" basis. It is understood that the machine tool division of the National Defense Advisory Commission is now making a survey among all defense contractors to obtain definite information on the number of tools of each type, size, etc., that will be required for all work thus far undertaken.

Responding to an inquiry from THE IRON AGE, a number of machine tool manufacturers have stated what, in their opinion, should be done to increase the supply of tools. The suggestions of E. C. Bullard of the Bullard Co., Bridgeport, Conn., are particularly pertinent.

"Production can be speeded up," says Mr. Bullard, "by expansion which may be accomplished in any one or all four of the following ways: 1. Modernization of plant facilities; 2. Expansion of shifts with consequent training of more men; 3. Expansion in use of subcontractors; 4. Expansion of plant and facilities. In my opinion members of industry would willingly undertake such expansion if they knew definitely what was expected of them and were assured by direct government assistance that they would remain financially sound at the expiration of the emergency. All of the above mentioned phases of expansion have been entered into by the Bullard Co."

Henry S. Sharpe of the Brown & Sharpe Mfg. Co., Providence, R. I., said: "I believe the machine tool industry can achieve increased production by working longer hours. Practically, a longer week is not feasible unless the President will implement his justified concern for Britain and America by frank appeals to all involved."

James E. Gleason of the Gleason Works, Rochester, N. Y., says: "Machine tool industry in 1940 has doubled production over 1939. In response to Mr. Knudsen's plea for more production we will all try even harder and accomplish more."

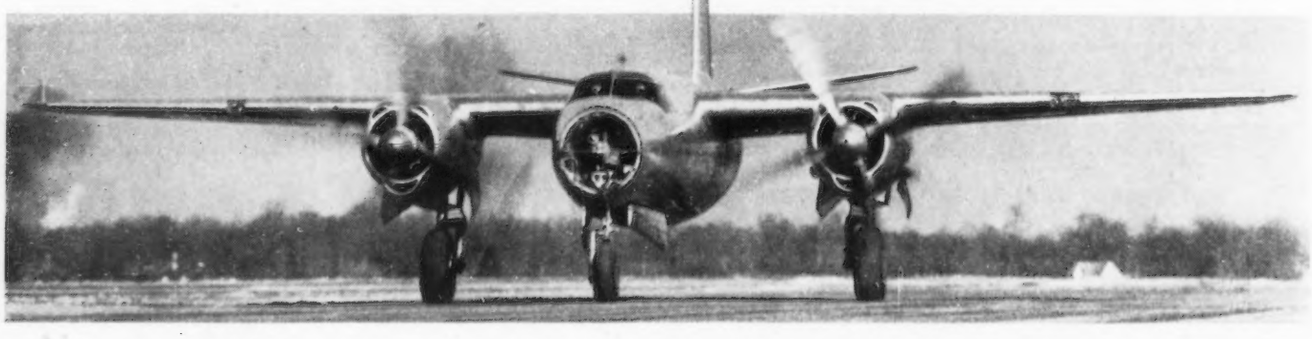
H. K. Clark of the Norton Co., Worcester, Mass., wires: "Our own plant doing everything possible to meet Mr. Knudsen's plea for advanced delivery dates. We shall do our very best to accomplish what he calls the impossible."

Cincinnati machine tool executives are convinced that the methods of speeding up production in accordance with Mr. Knudsen's recent plea to the industry are limited to three avenues: Increase of plant equipment and manpower, broader subcontracting, and enlargement of plant space. Calling attention to the fact that the industry had doubled its production in the last year, one outstanding company president, who desired his name withheld, declared that more production could be obtained by training more men to fill the gaps now existing in night shifts.

In addition, he continued, other plants making kindred products with machinery and labor available should be given subcontracts by the already oversold regular producers. His last solution would be the building of new plants, because, in his opinion, it would take almost a year to build and equip additional factories.

"We have been in several conferences about that," said August Tuechter, president, Cincinnati Bickford Tool Co., when asked what the industry could do about speeding up production. "We believe that with our plant expansion we will increase output 35 to 40 per cent and maybe more."

THE MARTIN B-26 bombing plane, at the Glenn L. Martin plant, which is to receive tests by the United States Army. The craft, new type medium bomber of midwing monoplane design, embodies the latest features demanded in modern combat. It has power turrets, great fire power, self-sealing fuel tanks and protective armor. Although it is a bomber, it is said to be faster than most of the pursuit planes now fighting in Europe. It can accommodate a crew of five.



"We are expanding our facilities and increasing the training program," Richard Le Blond, president, R. K. Le Blond Machine Tool Co., said. "In our case, we believe we have done a good job and have increased from a fair year in 1939 to the biggest production year in our history in 1940. In our particular case, we are trying to increase production 25 per cent during the coming year."

Jack C. Carlton, president, Carlton Machine Tool Co., declared: "Here in Cincinnati the construction of the new Wright Aeronautical plant, which expects to employ 15,000 men, is presenting a new problem. There are not that many men in the machine tool industry and, with them starting to employ skilled workmen, we are going to have to compete to keep our forces intact. If, however, this new plant does not seriously reduce our number of factory workers and we can continue as at present, I believe that our plant can increase its production 20 per cent."

"There are several things the industry can do and most of us are doing those things; putting in new equipment, training more men and adding to our plant space," Perrin G. March, president, Cincinnati Shaper Co., commented.

That the so-called "bottleneck" of the defense program is not in the machine tool industry but in the lack of clearly defined requirements emanating from the Defense Commission is the almost unanimous opinion of machine tool leaders in Wisconsin and Illinois.

Appreciating Mr. Knudsen's compliments on the job the industry has done so far, machine tool executives question the advisability of even more production when they cannot find out exactly what is needed if production is to be stepped up.

In the words of Joseph L. Trecker, vice-president, the Kearney & Trecker Corp., Milwaukee: "The machine tool industry has cooperated in every way to even a greater degree than it has been asked to do and it will certainly continue to do so. Most manufacturers have doubled and even tripled their output this year and will increase this even more in 1941 as the impact of new equipment and plant expansion is really felt. But it is difficult to see how the industry can step up production radically over what it has already done without knowing specifically what is needed."

Bearing out Mr. Trecker's citation of production increases already obtained, was the comment of H. B. Kraut, president, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. "Our expansion program, totaling about $2,000,000, will increase production from about 20 to 24 machines a month to a monthly total of between 50 to 60 machines. This increase will be achieved some time in the late spring and we will still retain flexibility, manufacturing machines that will cost from $8000 to over $100,000 each. Our business in 1941 will be more than double that of 1940, and another 50 per cent increase over that will be achieved in 1942."

"This company's production for 11 months in 1940 was three times greater than the same period in 1939," said Hugo L. Olsen, president, Sundstrand Machine Tool Co., Rockford, Ill., "and the last three full months of this year saw one and one-half times more production than was achieved in the first quarter of 1940. The industry has been straining every nerve to meet the demand that has been placed upon it."

Another production gain in 1940 —this time of 100 per cent—was reported by A. B. Morey, treasurer, Gisholt Machine Co., Madison, Wis., who said, "not only this company, but the entire industry has cooperated in the defense program to the fullest degree and every reasonable effort to increase production even more will be made in 1941."

But it can clearly be seen that running through the minds of practically all the industry's executive and production heads, is the question: "If more production is needed from us, just how much and what kind is wanted?"

Already many plants have expanded far beyond the most optimistic or normal demands and, despite the fact that some of them have government financial aid, they all will have serious readjustments to make when defense demand ceases. However, they are united in their willingness to expand even more if those charged with the responsibility of defense can tell them just what this "emergency" is, and precisely what is needed from the machine tool industry. If "precisely" is too much to expect, the industry will be grateful for even a "vaguely definite" statement of requirements. But, they all agree, machine tools cannot increase production if they do not know just what and how much is to be produced.

Coming Events

Jan. 6 to 10—Society of Automotive Engineers, annual meeting and display, Detroit.

Jan. 7 to 9—Institute of Scrap Iron and Steel, Inc., annual convention, Baltimore.

March 25 to 29—American Society of Tool Engineers, Machine and Tool Progress Exhibit, Detroit.

April 16 to 18—Electrochemical Society, Inc., spring meeting, Cleveland.

April 23 to 25—Concrete Reinforcing Steel Institute, annual meeting, Hot Springs, Va.

May 5 to 7—American Gear Manufacturers Association, annual convention, Hot Springs, Va.

May 12 to 15—American Foundrymen's Association, annual meeting, New York.

May 19 to 23—American Society for Metals, Western Metal Exposition & Congress, Los Angeles.

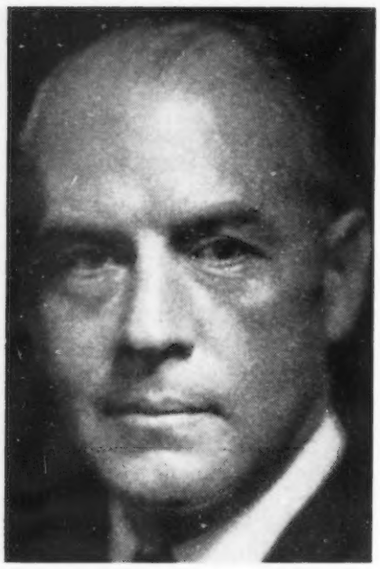
"Black Light" Discussed At Westinghouse Meeting

Buffalo

• • • **Improved protective** flood lighting of industrial plants will help foil would-be saboteurs during the present world crisis, Oscar P. Cleaver, illuminating engineer, Westinghouse lamp division, Bloomfield, N. J., told 300 plant engineers and executives who were assembled here recently.

"It is essential that sufficient shadowless light illuminate considerable area surrounding plants, keeping watchmen in the protection of the dark, yet covering every inch of possible entrance," he said. "Black light" perfected to assure safety to workers under adverse conditions and as a protection against black-outs, was also discussed by the lighting expert.

Must U. S. Fight?—Two Industrial Leaders Debate That Question



THOMAS S. HAMMOND

CLARENCE B. RANDALL

EDITOR'S NOTE: *Can America stay out of war? Must it fight to save the British Empire? Or Democracy? Not for generations have Americans faced more momentous questions. Opposing viewpoints on some of these problems by two industrialists, Clarence B. Randall, vice-president, Inland Steel Co., and Brig. Gen. Thomas S. Hammond, president, The Whiting Corp., are carried in the following letters which they authorized* THE IRON AGE *to publish. (Mr. Hammond is chairman of the Chicago chapter of the America First Committee.)*

° ° °

Dec. 13, 1940.

Dear Tom:

War does extremely funny things to normal relationships among businessmen. You and I are almost always on the same side of any given question, and I have worked with you and for you so many times that I have great respect for the effectiveness of your leadership.

Because of our association in other situations, my conscience tells me that I ought to write you this letter to say that I am compelled to differ with you on the America First matter, and that I shall have to exert what influence I may have the other way. I have had to say this likewise to Edward Ryerson, for whom also I have such deep respect and affection.

My mother's favorite brother was killed in the Civil War. I spent two years in the last war, of which nine months were in France, although, unfortunately, my unit wasn't in combat, and went back to France in 1921 and visited all of the great American cemeteries, and I know what war means.

I somewhat resent the suggestion that those of us who think the other way seek war.

To my mind the question is far from being as simple as war or no war. Your group seems to suggest that to say "no war" settles everything. You talk in terms solely of personal and national expediency.

On that ground alone I should think that you were wrong. Utter selfishness would, I think, lead me to differ with you, but quite apart from that I feel a deep pull of principles. It does seem to me that everything that I cherish in life is at stake, that men of my kind are dying for things that I believe in, and that I am not true to my own code if I refuse them assistance.

My viewpoint is, therefore, that they should be given all help, not just in Gen. Wood's sense of letting them buy all they can pay for, but in the larger sense of doing everything, which those who understand the problem best believe will help them win their objective.

That doesn't necessarily mean war. If it does I am prepared to accept in my own life the consequences of what I am saying, but the decision of whether or not it shall mean war is more likely to rest with Hitler than with us.

He could certainly make that decision now if he wanted to.

You will know that my high regard for you is not in any way affected by reason of the fact that in this instance we differ. But I did think that my conscience would be a little easier if I told you where I stand.

Very truly yours,
Clarence B. Randall.

* * *

Dec. 18, 1940.

Dear Clarence:

While we do not now agree on this question, your letter was not hard to take. You were most frank and may I be as frank with you?

First, I doubt if I need tell you that I am for a prepared U. S. A. capable of defending itself against any power or combination of powers. Like you, my family has had a long service with our armed forces, dating back to the Revolution. My older brother and father graduated from West Point. My grandfather commanded a cavalry unit in the Civil War. I personally did 18 months in France with a combat unit—the Rainbow Division.

Second, I earnestly hope the British Empire as we have known it may survive this war.

However, I do not believe that the American people want to or should make the sacrifices in human lives of our participating in a shooting war which might be necessary to preserve, not England alone, but the British Empire, and to help regulate Europe and Asia.

Further, we are most unfair to the British unless we tell them now that we have no intention of

active participation in a European war.

To lead them on with hope of more and more help from us and another A. E. F. unless we really intend to go that far is both unfair and inhuman. I certainly believe we will not go that far. I certainly believe the overwhelming majority of our people would not approve of active military intervention in the war. This Great Britain should know now.

But more important than all others is my belief that our participation would prolong the war by many years. Particularly so, if it is the declared purpose of the British that the German people must be crushed as has been intimated. Must our sons die for that objective?

What have we left? It seems inconceivable to me that at the end we would find it possible to preserve our private enterprise and our American way of life.

So, while I respect your honest views and regard them highly, my conscience in this case takes me on the other side of the fence. I am sorry.

Best regards,
Tom Hammond.

Electric Industrial Truck Sales at New High

• • • **November domestic bookings** of electric industrial trucks and tractors reached the highest point in a number of years, the Industrial Truck Statistical Association's figures reveal. A total of 249 units was booked, compared with the previous high for the current year of 193 units in October.

Total net value of bookings for chasses only was $827,003.73 against the October figure of $653,682.20.

Cantilever type trucks accounted for 193 units of the total, capacities and base chasses prices of which ranged from 1000 to 10,000 lb. and $2,025 to $5,255 respectively, with a total net value of $649,968.93. In addition, there were 17 non-elevating platform trucks, capacities and base prices ranging from 3000 to 6000 lb. and $1,660 to $3,035 respectively, having a total net value of $33.074.80; 17 crane trucks, capacities and base prices ranging from 3000 lb. at 7 ft. to 10,000 lb. at 5½ ft. radius, and $4,980 to $7,450 respectively, with a total net value of $96,770; 16 tractors, capacities and base prices ranging from 200 to 1000 lb. to 475-2000 lb. draw bar pull and $1,300 to $2,595 respectively, had a total net value of $25,190; five special non-load carriers and one paper roll handler of 4000 lb. capacity, with base prices ranging from $3,600 to $4,285, had a total net value of $23,000. (All net values shown are at factories, after additions and deductions for variations from standard specifications, trade-in allowances, etc., when applicable.)

Industrial Milestones

139 YEARS OLD—After Jan. 1, 1941, Wm. B. Scaife & Sons Co., Pittsburgh, will be officially known as Scaife Co. This change, made in the interests of simplifying the name, in no way affects the corporate structure or management of this 139-year-old manufacturer of range boilers, tanks and gas cylinders.

Founded in 1802 by Jeffery Scaife, the original shop was in what is now downtown Pittsburgh. The name, Wm. B. Scaife & Sons, was first used in 1871, and "company" added in 1901. In 1892 the plant was moved to Oakmont, Pa., a suburb of Pittsburgh, where the laboratories, general offices and works are now located.

Since its origin, the firm has been continuously managed and operated by the Scaife family, direct descendants of the founder. For five generations, sons have succeeded their fathers as head of the company. Officers now are J. V. Scaife, Jr., president and chairman of the board; Alan Magee Scaife, vice-president and director.

An interesting note in the early history of the company records the fact that sponge buckets were made for the artillery in the War of 1812. And today, as in war years intervening, the Scaife Company contributes its share toward national defense.

Crucible Steel Plans $10,000,000 Expansion

• • • **Crucible Steel Co.** of America has made known through a registration statement filed with the Securities and Exchange Commission in Washington that it will spend about $10,000,000 in expansion in the next two years. Most of the expenditures will be made for improvements at the works of the Pittsburgh Crucible Steel Co., its subsidiary, at Midland, Pa. Installation of a new strip mill, electric furnaces and auxiliary equipment will take place at Midland.

It was also stated in the registration statement that consolidation of the operations of the Anderson du Puy spring works at McKees Rocks, Pa., with those of the Park works in Pittsburgh or the Midland works is being considered and that certain operations heretofore carried on its Spaulding & Jennings works in Jersey City, N. J., will soon be completely consolidated in its Halcomb works at Syracuse, N. Y.

The registration statement covers $15,000,000 of 3½ per cent 15-yr. sinking fund debentures. From the proceeds the company will apply $9,932,000 to the redemption of outstanding debentures, the balance of the proceeds to be added to cash funds.

Grinding Wheel Industry Finds Its Capacity Ample

• • • **The grinding wheel** industry has at the present time 82 per cent excess productive capacity over its present rate of operation, and the survey shows that the all-time peak production can be exceeded by 101 per cent on six months' notice, according to the Grinding Wheel Manufacturers Association.

Grinding wheel users are being assured that their needs will be met, and in turn they are being asked to cooperate by ordering well in advance of the time the wheels are to be used. They are likewise being asked by the association to cooperate by restricting their order quantities to near term demand so that orderly flow of abrasives to the users will not be impeded by too large anticipatory or inventory purchasing.

CONSIDERABLE EXPANSION IN COKE CAPACITY UNDERWAY

In addition to 1,245,000 tons of by-product coke capacity at two major furnace plants which constitutes replacement of old equipment, a total of 1,960,000 tons of new furnace plant by-product coke capacity has been assured and will be completed and in operation sometime in 1941. A total of 932,000 tons of furnace plant by-product coke capacity is in the provisional stage but no definite contracts have been let nor are there any indications as to when this production will be definitely decided upon.

Scheduled for completion sometime in 1941, is a total of 1,091,000 tons of by-product coke capacity to be built at various merchant plants.

New furnace plant by-product capacity assured and contemplated which amounts to 2,892,000 tons will, when completed, supplant a considerable amount of beehive coke production which the steel companies, now building by-product capacity, have been or would be using for blast furnace production.

Most of the new by-product capacity mentioned in the tables below has been contracted for in recent weeks and the average time for completion will run about eight to 10 months.

With approximately 6300 beehive coke ovens in operation in the greater Connellsville, Pa., district, a tremendous gain over the number in use a few months ago, work is rapidly progressing on the rehabilitation of more than 800 additional beehive coke ovens which are expected to be making coke within the next three to five weeks.

It is confidently expected that before the end of January more than 7100 beehive coke ovens in the western Pennsylvania regions will be producing coke at the rate of approximately 50 tons a month per oven.

Most of the ovens being rebuilt at the present time have not been in operation since World War No. 1.

Most of the production from these beehive plants represents furnace coke for blast furnace operation and before the approach of next spring, many of the ovens now available but not working will probably be put in shape so that by that date every beehive coke oven capable of producing material will have been fired.

Coke Renovates 400 Coke Ovens at Uniontown

Pittsburgh

• • • **H. C. Frick** Coke Co., subsidiary of U. S. Steel Corp., has begun renovation of about 400 coke ovens at its Collier mine near Uniontown which ovens have been idle since World War days. When the job is completed capacity of these ovens will approximate 20,000 tons of beehive coke a month.

This project is one of a number considered or already begun as a result of the exceptional demand created by the war.

Replaced and New Additional By-product Coke Capacity Built and to be Built in 1941

Replacements—Furnace Plants

Company	Location	Number Ovens	Annual Capacity Net Tons	Remarks
Carnegie-Illinois Steel Corp.	Gary	142 Koppers	938,000	Now being heated for production
Bethlehem Steel Co.	Bethlehem, Pa.	51 Koppers	307,000	Under construction

New Additional Capacity—Furnace Plants
Contracts Placed or Construction Assured

American Rolling Mill Co.	Hamilton, Ohio	25 Koppers	212,000	Under construction
Bethlehem Steel Co.	Buffalo	76 Wilputte	400,000	Under construction
Bethlehem Steel Co.	To be announced	To be announced	800,000	Announced by Bethlehem; contracts not placed yet
Tennessee Coal, Iron & Railroad Co.	Birmingham, Ala.	73 Koppers	548,000	Contract placed

Contemplated But No Official Action As Yet

Pittsburgh Steel Co. and Pittsburgh Coke & Iron Co.	Monessen, Pa.	.....	432000	Contemplated — no contract placed
Weirton Steel Co.	Weirton, W. Va.	64	500,000 (Est.)	Provisional estimate only. Appropriation not yet approved

New Additional Capacity—Merchant Plants

Connecticut Coke Co.	New Haven, Conn.	9 Koppers	78,000	Under construction
Citizens Gas & Coke Utility Co.	Indianapolis	41 Koppers	263,000	Under construction
Semet-Solvay	Ironton, Ohio	76 Wilputte	400,000	Under construction
Alabama By-Products Corp.	Birmingham, Ala.	25 Koppers	150,000	Under construction
E. I. du Pont de Nemours & Co.	Morgantown, W. Va.	37 Wilputte	200,000	contract just let

Recapitulation

	Net Tons
Total New Furnace Plant Capacity (Construction Assured)	1,960,000
Total New Furnace Plant Capacity (Contemplated)	932,000
Total New Furnace Plant Capacity	2,892,000
Total New Merchant Plant Capacity	1,091,000
Grand Total New By-Product Capacity	3,983,000
Estimated total by-product coke capacity as of Dec. 31, 1910	63,000,000

(Of the above estimated total capacity, 47,500,000 tons is at blast furnace plants and 15,550,000 tons is merchant capacity.)

Spreading of Defense Work is Proceeding Slowly in Some Areas

The plan to spread defense work among a larger number of manufacturers through widespread subcontracting of parts, which has been proposed as one means of speeding up the armament program by making use of all available machine tools, has received considerable impetus in some areas of the country while in others little or nothing has been done.

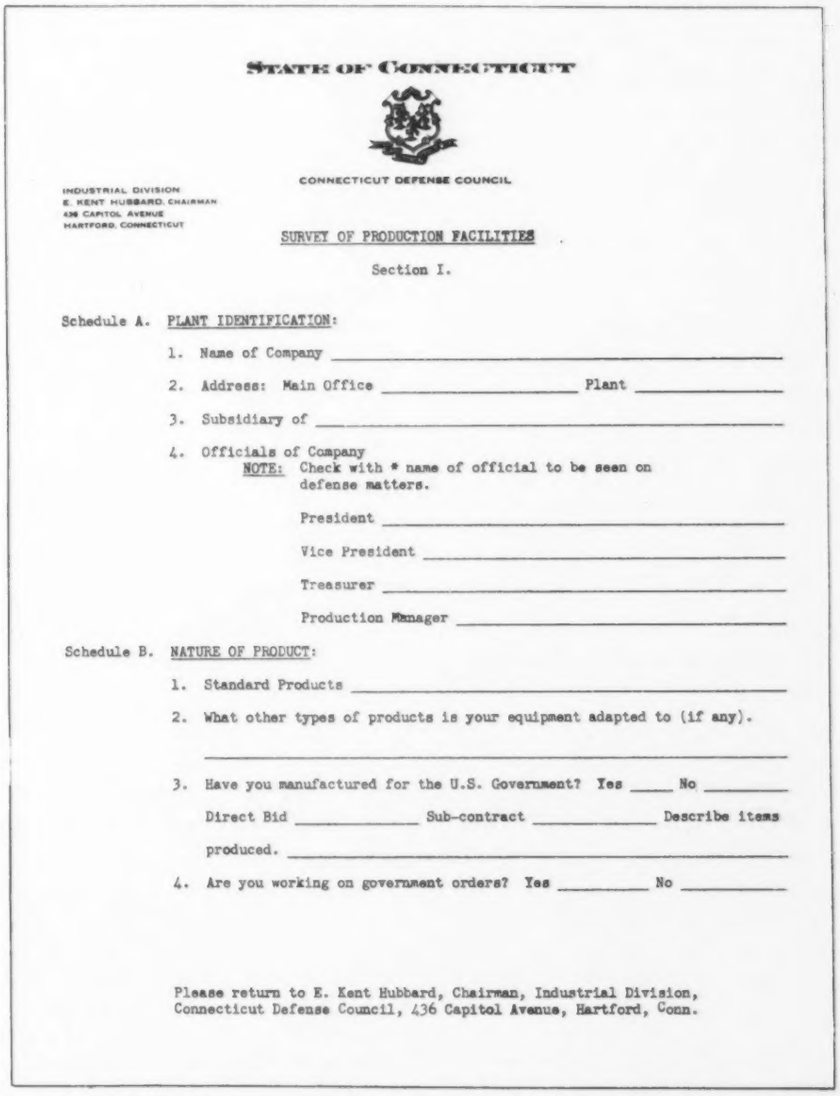
One of the most comprehensive plans is that of the Connecticut Defense Council. Organized by former Governor Baldwin, the plan has been carried forward by General Sanford Wadhams, with the cooperation of leading industrialists. E. Kent Hubbard of the Manufacturers' Association of Connecticut is chairman of the industrial division.

A survey of Connecticut industrial resources available for national defense was begun last July. At that time questionnaires were sent to all manufacturing companies soliciting information on available equipment, transportation and power facilities, employment statistics and other pertinent data.

Mr. Hubbard said that the Connecticut Defense Council was created even before the National Defense Advisory Commission was appointed by President Roosevelt.

"As a result of its inventory of industrial man and machine power," says Mr. Hubbard, "the State council has a complete list of available machinery in 1400 large and small industries throughout the State with all other pertinent data classified and arranged by a card system worked out by the International Business Machines Co. This is perhaps the first time in history that this has been done by any large industrial section. The classification was made up by a special committee of the most competent engineers we could find in industry and representatives of federal procurement agencies. These agencies and prime contractors can get in touch with the State council which gives complete information and arranges contacts."

A similar program has been worked out in St. Louis under the auspices of the Metropolitan Committee on Preparedness for National Defense, whose offices are at 511 Locust Street, that city. The St. Louis committee also sent out a questionnaire. About 1300 plants were surveyed and the information received was distributed to all companies which have received defense contracts direct from the government. Special lists were also sent to companies such as aircraft manufacturers. A direct result was the establishment of a St. Louis office by Beach Aircraft Co. of Wichita, Kan., to do nothing but have parts made by St. Louis sub-contractors. Curtiss-Wright, who are building a new plant in St. Louis, announced that as a result of this survey most of its sub-contracting will be done in St. Louis. The company had previously intended to send it elsewhere, not knowing of the facilities that were available in that city. Copies of the survey were sent to all procurement offices of the government, informing them



STATE OF CONNECTICUT

CONNECTICUT DEFENSE COUNCIL

INDUSTRIAL DIVISION
E. KENT HUBBARD, CHAIRMAN
436 CAPITOL AVENUE
HARTFORD, CONNECTICUT

SURVEY OF PRODUCTION FACILITIES

Section I.

Schedule A. PLANT IDENTIFICATION:

1. Name of Company _____
2. Address: Main Office _____ Plant _____
3. Subsidiary of _____
4. Officials of Company
   NOTE: Check with * name of official to be seen on defense matters.
   President _____
   Vice President _____
   Treasurer _____
   Production Manager _____

Schedule B. NATURE OF PRODUCT:

1. Standard Products _____
2. What other types of products is your equipment adapted to (if any).
   _____
3. Have you manufactured for the U.S. Government? Yes ____ No _____
   Direct Bid _____ Sub-contract _____ Describe items produced. _____
4. Are you working on government orders? Yes _____ No _____

Please return to E. Kent Hubbard, Chairman, Industrial Division, Connecticut Defense Council, 436 Capitol Avenue, Hartford, Conn.

FIRST STEP in Connecticut Council of Defense's program of assisting in the national defense program was a state-wide inventory of machine and man power, which yielded data from 1400 large and small plants having available machinery. Classification was accomplished by a special committee made up of most competent engineers that could be found and representatives of federal procurement agencies.

as to parts that could be made in St. Louis, of the equipment and other facilities available there. The St. Louis committee also has a labor training committee, which has four technical schools working 18 hr. a day and expects soon to be on a 24 hr. basis. About 3500 men are in training now.

In Chicago the industrial department of the Chamber of Commerce has created a clearing house to acquaint members with government purchasing procedure as regards the products of an individual plant. A complete record of all primary defense contracts is maintained for the benefit of potential sub-contractors. The chamber also is cooperating with the district office of the Ordnance Department in locating machine tool capacity that is not being used. A complete survey of all plant facilities in the Chicago area was conducted and also a special survey of warehouses of 100,000 sq. ft. or more.

In Kansas City, where considerable available machine tool capacity is said to exist, a group has been formed to handle the problem of obtaining defense sub-contracts. No details have been announced, but it is said the plan will be functioning in about a month.

York, Pa., is one city that has had a plan of sub-contracting work in operation for some time. This plan is explained by the York Chamber of Commerce as follows: "When individual plants in York started to bid on defense contracts they discovered that most of these orders required types of tools that were not all to be found in one plant. Consequently a cooperative arrangement was arrived at by which one company takes the contract, uses the tools of another company which it lacks and for which the other company does not have full-time use. A survey of the non-metal industries disclosed that some very fine tools which had been acquired only for repair and maintenance purposes could be used several hours a day when needed."

Because of nearly 40 years' intimate experience with the business of sub-contracting of major manufacturing programs, Detroit is in an especially favorable position for continuing the same technique and applying it to the defense program. Two major steps have been taken to facilitate the sub-contracting of defense work.

The first was initiated months ago when the Douglas Aircraft Corp., Santa Monica, Cal., in a series of conferences and negotiations made plans with long-established automotive supplying firms for the manufacture of parts and sub-assemblies to go into airplanes. At present $75,000,000 worth of such contracts have been negotiated with Murray Corp. of America, Briggs Mfg. Co., and Fisher Body Division of General Motors Corp.

Of extreme importance is a qualification of the above statement which indicates that other attempts at sub-contracting will have some hurdles to jump—the formal Douglas contracts still hinge upon the placing of "facilities contracts" by the government with some of the sub-contractors and approval of manufacturing equipment and methods by the Army in some other instances. In other words, while these industries got together voluntarily months ago, production is not yet a reality. At the same time, these sub-contracting firms have gone ahead with the training of hundreds of men, tooling and (in the case of Briggs) erection of a new plant partly in anticipation of such jobs as that being placed by Douglas.

Summarizing this phase of the Detroit program, industries there, which are probably the most experienced in the world in the technique of serving as sub-contractor (supplying bodies and body parts to most of the automobile companies in the past), have found it a costly and imposing task to make themselves ready for participation in the defense industry. Obviously, the sum total of private capital being risked, the voluntary nature of the undertaking and the experience of the participants, removes any doubts as to the wholeheartedness of these efforts.

The second major stop to facilitate sub-contracting of defense work has been undertaken by the automobile manufacturers under sponsorship of the Automobile Manufacturers Association at the suggestion of William S. Knudsen, defense commissioner. The organization formed to promote this idea is the Automotive Committee for Air Defense under directorship of C. C. Carlton. A most adequate description of "How Qualified Plants Can Share in Automotive Programs to Build Planes" was prepared by Mr. Carlton at the suggestion of The Iron Age and has been widely published (The Iron Age, Dec. 19, page 72).

This automotive plan is probably the most complete and most adequate ever set up for the handling of such a program. It is, however, as yet only in formative stages and it is expected that in carrying out its plans to accomplish the objective of making thousands of bombing planes, the automotive committee will have to overcome the same kind of hurdles that the individual organizations named above have found in their pathway.

One of the important functions of the ACAD, so far, has been the arranging of an exhibit of specimen parts which will be needed in the airplane program. This is one of the needs pointed out by a prominent Detroit industrialist, R. C. Mahon, who has suggested the necessity for five or six major exhibits of defense requirements spotted strategically about the country so manufacturers can inspect specimens of the goods needed by the Army, Navy and Air Corps. He added to this the suggestion that if physical exhibits were not possible, then a "mail order catalog" type of listing should be made available for the study of manufacturers, especially small plants. This suggestion has the merit of permitting the management and engineers of even the smallest plants to study the parts which they would be asked to manufacture or to study printed data, sketches, photos, etc., that would help to visualize parts required. This suggestion was made in the belief that many manufacturers would then be able to notify the government of their availability for specific types of work.

Other groundwork already existing in Detroit for an elaborate system of sub-contracting of defense parts include the normal list of vendors maintained by each of the automobile companies. Each major producer is estimated to have 6000 to 8000 sources of supply (many of these overlapping

and supplying Ford, Chrysler and General Motors, for instance) and the motor manufacturers have intimate knowledge of the capacity and ability of each supplier.

Recently, as in the rest of the country, banks acting under instructions of the Federal Reserve Bank have conducted a survey among manufacturers to determine what financing would be required for participating in defense work and what facilities are already available. It is estimated that between 700 and 800 firms in Detroit are being contacted this way now.

In addition, the Board of Commerce has indicated its willingness to help any prime contractor locate sources of supply when necessary. So far, of course, most prime contractors are only in the process of laying out plants and processes.

One of the most advanced programs in the area is the Chrysler tank arsenal. Recently E. J. Hunt, tank plant manager, made the statement (Iron Age, Assembly Line, Dec. 12, page 72): "Not only are we seeking the actual materials and parts (for tanks) but also we are trying to investigate every possible source of supply for the things out of which we will make tanks." Among the materials and parts which will be required, he said, are forgings for heavy gears, shafts, pinions and hubs; various kinds of gages, including those for oil, gas and electric apparatus; helical springs; electrical panels, including fuse boxes, terminal boxes and relay boxes; large battery switch box assemblies; and various meters, such as voltmeters, ammeters, tachometers, speedometers and many others.

Such an announcement from Hunt, with the consequent publicizing of the requirements of the tank arsenal, was an important step toward placing many subcontractors and suppliers in touch with Chrysler.

Another major step in placing sub-contracts has been undertaken privately by such organizations as Douglas Aircraft Corp., Wright Aeronautical Co. and others which have opened Detroit offices staffed by buyers, materials experts, production men and inspectors who are coordinating the work of plants which have taken contracts to supply assembly lines at the home plant.

Just north of Detroit and close enough to be almost part of it, is Pontiac which has at the present time about $32,000,000 worth of government orders, most of them at the Yellow Truck plant. In Pontiac, the Federal Reserve Bank, through the Chamber of Commerce, has conducted a survey among the 33 manufacturing plants in the town to find out if they needed financing for government orders which they now have, or might get. Pontiac, of course, is an important plant city for the General Motors Corp. Of the 10 members of the Manufacturers Association, seven are General Motors plants which, of course, will participate in manufacture of those items for which General Motors is now contractor or will later contract to make for the government. There are seven independent manufacturers wth sizable plants. One of them has no orders at all, and several have small contracts directly from the government. There are 16 small concerns, some of them in need of financing and some of which have indicated that they are not interested in working on government contracts.

Several machinery builders in Saginaw with signed contracts have farmed out defense work to other local manufacturers with available equipment. All are now working to capacty. All General Motors plants in Saginaw are working on defense parts and the General Motors steering gear division is erecting a new plant for machine gun production.

The Grand Rapids Chamber of Commerce reports that it has already handled direct inquiries from several major industries leading to sub-contracting on defense orders. This local group has made arrangements to issue bulletins to its membership whenever possible sub-contracting work makes its appearance so that those firms which have equipment and personnel available can negotiate contracts.

Toledo reports that already there has been considerable letting of sub-contracts, so far on an unorganized basis. The Toledo Chamber of Commerce is now putting in effect a plan through questionnaire to rate and inventory all usable machine capacity in Teledo. This is a direct and important effort to organize and determine the feasibility of handling prime contracts and sub-contracts

A FOREST OF DRILLS for the Navy. A few of the drills at work in the Torpedo Station of the Navy in Alexandria, Va. Production has been speeded up to equip our two-ocean Navy.

on a joint community basis). This step seems desirable in Toledo because of the diversification of some 500 industries and their complete union through belt line railroad and ample rail facilities. Apparently it would lead to the possibility of handling major contracts, with individual plants acting almost as "departments" to carry out various phases of the contract.

Through sub-contracts the government defense program is spreading rapidly in Northern Ohio, but judging from unengaged facilities, the peak is still well in the future.

Screw machine capacity appears to be well occupied in that area, and many forging plants are heavily engaged, but on the other side of the ledger there are extensive facilities in the stamping and fabricating fields which remain open.

In that vicinity 178 companies are supplying parts to the aircraft industry, and many of these 178 firms have sub-contracted freely. Around 200 companies hold orders which the district Army Ordnance office is inspecting. Some of these 200 companies hold anywhere from 25 to 80 separate orders from the Ordnance Department, and have sub-contracted to expedite production. Orders from the Navy, the Quartermaster Corps, and the British add further to the heavy volume of armament business in that area. The machine tool industry has sub-contracted to a wide degree all over Ohio.

One company holding a large contract for Army tanks is being supplied 250 parts in Northern and Central Ohio.

Sub-contracting has been encouraged by governmental authorities, who are seeking to spread the work around as freely as possible. A downstate company estimated it was capable of producing howitzers without outside aid, but was advised that it would be better to sublet part of the work.

Certain plant owners have remained on the side lines because of unfamiliarity with parts required for the defense program. To help overcome such uncertainty and to expedite sub-contracting, the Cleveland Chamber of Commerce is going to establish a large permanent exhibit of parts which can be visited by manufacturers, who will then be able to see whether they might join in production. All leading cities in Ohio have prepared lists of facilities.

No particular difficulty has been encountered in distributing ordnance awards, as these are generally considered attractive from the production standpoint. One reason for this is because of the long runs which can be enjoyed.

Apparently some plants capable of assisting machine tool producers feel that the work is quite difficult, but despite this feeling, around three-quarters of the machine tool industry is sub-contracting. This is not accomplished without problems for the machine tool producer, who sometimes finds his shop unbalanced, and that he is bearing added costs of supervision, jigs and fixtures and inventories, and perhaps not getting the high degree of workmanship that he expected.

Annual Defense Steel Needs 8,000,000 Tons, Girdler Says

• • • **With a steel** ingot capacity almost 60 per cent greater than the maximum annual output for all of Continental Europe outside of Russia, the steel industry of the United States is today prepared for national defense, said T. M. Girdler, chairman of the board, Republic Steel Corp., in the company's publication "Republic Reports." Mr. Girdler pointed out that the present rated production capacity for the steel industry of the nation is approximately 83,000,000 net tons of steel ingots, an increase of 22,000,000 tons since 1920. Against this capacity, he said, requirements for defense purposes will not exceed 8,000,000 net tons of ingots annually.

"Although there is no need for any major increase of basic steelmaking capacity at this time, it would be highly erroneous," he said, "to think the industry is standing still in improving its facilities. Wherever the need appears, the industry is improving and expanding its facilities to meet special defense requirements.

"But practical steelmen went right ahead. What they had in mind, of course, was the countless new uses and new markets for steel which were steadily developing. In view of the national defense emergency which has arisen, it is fortunate for the country that the program of plant improvement and modernization was undertaken. As a result of it, the nation now has ample steel capacity to supply the enormously expanded military needs, and the regular commercial requirements, as well."

In his article, Mr. Girdler pointed out that typical of the industry's improvements, have been those made by Republic.

"Only last month," Mr. Girdler said, "new, important plant improvements were announced. These include the installation of a 4-stand, 4-high, 54-inch cold mill in Cleveland, in connection with the company's continuous mill; the enlargement and rebuilding of the No. 4 blast furnace at Youngstown; the adding of a fifth 50-ton electric furnace at Canton; the installation of a 4-high, single-stand, skin-pass mill at Monroe; and the rebuilding and enlargement of soaking pits in Gadsden."

Sheet & Tube Buys Central Tube Building

Youngstown

• • • **A large steel** building, part of the old Central Tube Co. plant at Ambridge, Pa., has been purchased by Youngstown Sheet & Tube Co. from the Hetz Construction Co. of Warren, Ohio.

The building will be dismantled and shipped to the Chicago district, where it will be re-assembled and used as a billet yard.

The Ambridge plant, built in 1924, was abandoned some time ago and is being sold for defense industry purposes.

The Copperweld Steel Co. of Warren also is taking some of the plant's equipment for its recently announced expansion program.

$52 Millions for Plant Expansion

Washington

• • • **Nine plant facility** expansion contracts aggregating $52,619,897 of which $45,000,000 was involved in a contract with the Carnegie-Illinois Steel Corp., for building, machine tools and other equipment at the Government-leased plant at South Charleston, W. Va., were announced by the Navy last Thursday. Part of the defense speed up program, all of the contracts except one called for the purchase of machine tools along with outlays for building expansion and other equipment.

The complete list of firms—all engaged in ordnance production—entering into contracts with the Navy for the expansion of plant facilities is shown in the accompanying table.

Location	*Contractor*	*Nature of Expansion*	*Amount*
South Charleston, W. Va.	Carnegie-Illinois Steel Corp.	Building, machine tools and other equipment	$45,000,000
Harrison, N. J.	Crucible Steel Co.	Building extension, machine tools, and other equipment	125,000
Chicago	Goss Printing Press Co.	Building and equipment	505,490
Chicago	Goss Printing Press Co.	Machine tools	359,110
Minneapolis	Northern Pump Co.	Building, machine tools, and other equipment	3,473,297
Minneapolis	Northern Pump Co.	Buildings, machine tools and other equipment	2,000,000
Alliance, Ohio	Babcox & Wilcox Co.	Machine tools and other equipment	250,000
Rochester, N. Y.	Bausch and Lomb Optical Co.	Machine tools	512,000
Jersey City, N. J.	Westinghouse Electric & Manufacturing Co.	Machine tools and other equipment	295,000

Armament Firm Buys Old Carrier Corp. Plant

• • • **Sale of the old** Carrier Corp. plant in Allentown, Pa., to the American Armament Corp., engaged in manufacturing artillery, machine gun, aerial bomb and anti-aircraft gun parts, has been announced by J. I. Lyle, president of Carrier Corp., Syracuse, N. Y. The 52,000-sq. ft. building on the Emmaus Highway was one of five plants vacated in 1937 when the Carrier Corp. moved to Syracuse, consolidating all manufacturing facilities in the former Franklin automobile plant there.

Outlaw Strike Ended At Homestead Plant

Pittsburgh

• • • **A three-hour strike** last week of six men at Carnegie-Illinois Steel Corp.'s 100-in. plate mill at Homestead near here was stopped by a promise of a rapid settlement of wage grievance said to arise from installation of new machinery. Approximately 300 other workers sympathizing with the six employees involved carried out a stoppage of work demonstration until a truce was reached. Production on the entire mill including a substantial amount of defense work was halted by the strike.

Scrap Convention to Hear Leon Henderson

• • • **A forum on scrap** production and scrap requirements will be conducted at the annual convention of the Institute of Scrap Iron and Steel, Inc. in Baltimore on Thursday, Jan. 9. G. L. Rathel, Continental Steel Corp., Kokomo, Ind., will speak on "Responsibilities of Scrap Consumer and Supplier." Samuel G. Keywell, Samuel G. Keywell Co. Inc., Detroit, will deliver a complementary paper on "Changing Trend in Scrap Production." At the same session, Leon Henderson, member of SEC and chief of the price stabilization division of the national defense commission, will speak on "Price Aspects of National Defense Program."

Correction In Census On Cars, Steel Springs

Washington

• • • **Two errors** were inadvertently made by THE IRON AGE in recent reports on census returns. In the issue of Nov. 21, page 82, it was stated that "In 1937 there were 4,732,553 units (passenger automobiles) manufactured, carrying a value of $2,848,786,150." These were totals for all motor vehicles. The number of passenger cars produced that year was 3,847,800 and their value was $2,296,511,131.

In the issue of Dec. 5, page 76, an article relating to steel spring production in 1939 carried the parenthetical phrase "(excluding automobile springs)." The Census Bureau's Division of Manufacturers advises that data for automobile springs are included in the statistics when made for sale or for intraplant transfer. Such springs are excluded only when installed in automobiles in the same plant location in which springs are produced.

Jury Chosen for Bridge Design Competition

• • • **The following jury** has been appointed by the American Institute of Steel Construction to select the prize winning designs in the Students' Annual Bridge Design Competition: Dr. Shortridge Hardesty of Waddell & Hardesty, Consulting Engineers; Walter H. Weiskopf of Weiskopf & Pickworth, Consulting Engineers; John T. Briggs, architect; M. W. Del Gaudio, architect, and Theodore Reed Kendall, Engineering Editor, *The American City Magazine*, all of New York. These men will meet at the headquarters of the institute, 101 Park Avenue, New York, on February 19 to make their selections.

Pittsburgh Steamship to Order 2 New Ships

Cleveland

• • • **Construction of two** new ore carriers is planned by the Pittsburgh Steamship Co., it is announced by A. H. Ferbert, president of the company, a subsidiary of the United States Steel Corp. Definite specifications as to the size or type vessels to be built have not been fully determined. The last ore carriers constructed on the Great Lakes were the four 600-ft. vessels which were launched by the Pittsburgh Steamship Company in the fall of 1937.

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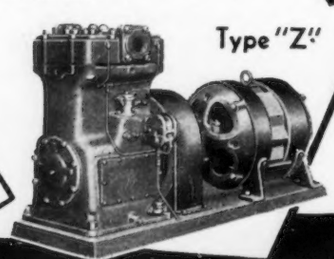


Westinghouse » » »
AIR BRAKE CO. INDUSTRIAL DIVISION PITTSBURGH, PA.

Court Ruling Favors Independent Union

Chicago

• • • **Citing the fact** that 100 per cent of the employees testifying favored the plant union, the United States Circuit Court of Appeals claimed that this testimony could not be ignored and refused to uphold an NLRB order against the Automotive Maintenance Machinery Co., North Chicago. The labor board had requested enforcement of an order directing the company to "cease and desist" from dominating the AMMCO Workers' Association, from contributing to its financial support, from interfering with the employees' right to self organization, and from recognizing the organization as the collective bargaining representative.

Steel Basing Point Case Postponed to October, 1941

Philadelphia

• • • **The Federal Court** of Appeals here has ordered a stay until the first Monday of October, 1941, in all proceedings in the Federal Trade Commission's action against the United States Steel Corp. and subsidiaries involving the practice of selling steel under the basing point system. The court acted on joint motion of counsel for both sides. Further action will not be taken until a similar issue is decided in the commission's case in the cement industry. It is believed that the decision in the cement case may clarify some of the points involved in the proceedings against U. S. Steel.

Oil Field Machinery Output Lower in 1939

Washington

• • • **Decreases in production,** employment and wages for 1939 as compared with 1937 are reported for the manufacturers of oil-field machinery and tools by the Bureau of the Census. While the value of products decreased from $126,666,047 in 1937 to $88,977,327 in 1939, the number of wage earners declined from 16,347 to 12,519 and their wages dropped from $25,248,455 to $18,740,996. Number of establishments, on the other hand, increased from 179 in 1937 to 223 last year.

Detroit Welding Society To Hear R. F. Flood

Detroit

• • • **R. F. Flood,** The Linde Air Products Co., will address the January meeting of the Detroit Section, American Welding Society, on Friday, Jan. 3, at Detroit Leland Hotel. He will discuss the use of the oxy-acetylene flame for flame hardening steel and iron, covering methods of application and result attained. He will also include description of newer processes of flame strengthening, covering experimental work and applications to which the process may be applied. In addition, the flame softening process and its various uses, especially in connection with the oxy-acetylene cutting of air-hardening steels will be discussed.

Snobbery Causes Worker Shortage, J. R. Weaver Says

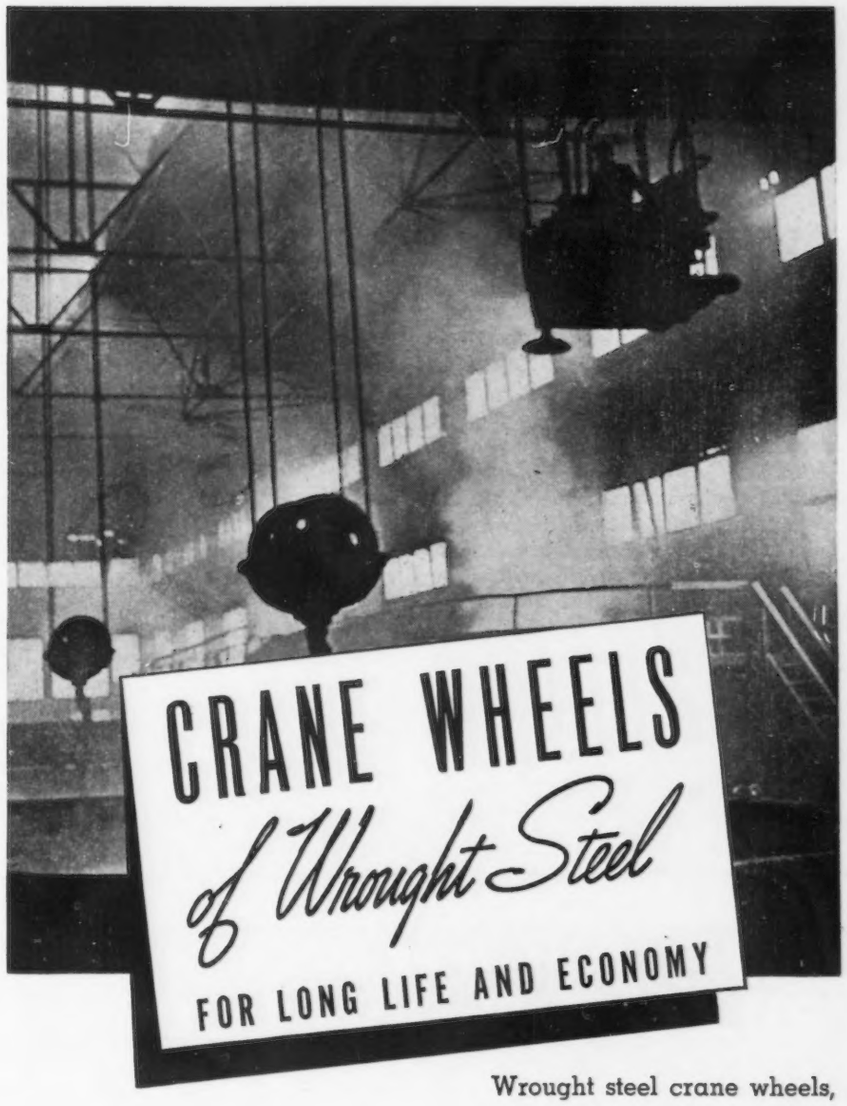
Pittsburgh

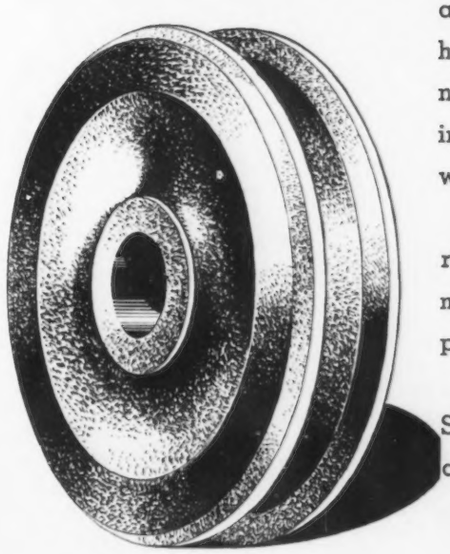
• • • **Our young people** are not responsible for their gravitation toward white collar jobs and the trend is forced by senseless, outworn, social snobbery, J. R. Weaver, emergency products division, Westinghouse Electric & Mfg. Co., recently told a group of Allegheny County educators. "I am convinced that for the last 25 years we have been absolutely blind in our insistance on training our young people for white collar and professional jobs and neglecting the necessary skilled workers for public and private industry," said Mr. Weaver.

Weirton Independent Union Elects Representatives

Weirton, W. Va.

• • • **Employees of Weirton** Steel Co. here and Steubenville, Ohio, recently held their annual election of employee representatives with 97.5 per cent of those eligible to vote participating in the election. Six of the successful candidates will serve as employee representatives for their eighth consecutive year, having been elected and reelected since inception of the employee representative plan in 1933. The newly elected representatives have already met and elected the general chairman and general secretary for 1941.





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British Contract For 60 Ships Here

• • • **About 120,000 tons** of steel will be required for 60 ships to be built for the British government by the Todd Shipyards Corp., 1 Broadway, New York. A contract was signed last week by John D. Reilly, president of Todd, and R. R. Powell and Henry Hunter, representing the British Purchasing Commission.

This contract may be only the forerunner of a huge shipbuilding program to be carried out in the United States for the British along the lines of the big job undertaken by the United States at Hog Island, Philadelphia, during the first World War. It is understood that not less than 120 ships will be built eventually, and possibly more.

The contract for ships is part of a $3,000,000,000 British armament program to be carried out in the United States to hasten aid for Great Britain.

Two new shipyards will be established, one at Richmond, Cal., and the other at Portland, Me. Todds Shipyards Corp. has formed two subsidiary companies to handle this work. The Todd-California Shipbuilding Corp. will handle the work on the West Coast and the Todd-Bath Iron Shipbuilding Corp. that on the East Coast. Henry J. Kayser, director of the Seattle-Tacoma Shipbuilding Corp., a Todd affiliate, becomes president of the Todd California Shipbuilding Corp., and William S. Newell, head of the Bath Iron Works, Inc., Bath, Me., president of the Todd-Bath Iron Shipbuilding Corp.

The new ships will cost $1,600,000 each, including cost of shipyard construction, and will register 10,000 deadweight tons, with length of 416 ft. and beam of 57 ft. They will be of simplest possible construction so that parts can be fabricated by structural and plate fabricating shops. Names of subcontractors have not yet been announced, but it is understood that contracts have been awarded for boilers, engines and fabricated parts, or will be soon. The first ship is to be launched Oct. 1, next, according to plan, and the entire contract completed within 18 months. Work was started on the building of the shipways within 10 hours after the contract had been signed. The yards will be completed within four months, but keels for the first ships will be laid within two and a half months.

Construction of new yards for the ship program was made necessary by the fact that the U. S. government insisted that the work should not disturb any existing contracts of the Maritime Commission or the U. S. Navy. It is understood that priorities for steel and other requirements will be forthcoming under the priority setup now being worked out in Washington.

British To Negotiate On New Contracts

Washington

• • • Depending upon Congressional approval of his "lend-lease" plan, President Roosevelt has authorized Great Britain to negotiate for approximately $3,000,000,000 worth of American supplies, consisting of 12,000 combat planes, mostly two-engined bombers, costing about $1,200,000,000; tanks, artillery and other ordnance materiel, costing approximately $1,700,060,000 and additional cargo ships, costing about $100,000,000, doubling the cash purchase last week of 60 such ships.

The President told the British purchasing officials that the matter of payment, which he has proposed be made "in kind," will be taken care of by Congress. The British were asked not to sign any contracts until that time.

Valley Mould Pays Dividend of $3

• • • **Valley Mould & Iron Corp.,** Hubbard, Ohio, declared a year-end dividend of $3 a share, payable Dec. 23 to shares of record Dec. 14.

For Efficient Pickling
RUSTLESS Chooses RODINE

The Rustless Iron and Steel Corporation of Baltimore, Md., has made great strides in developing and producing alloy steels. Their new mill gives ample evidence of this leadership. The pickling room (shown above), for instance, is a model for efficient cleaning and descaling.

For many years the Rustless Iron and Steel Corporation has used Rodine, and they will continue to use Rodine in the modern pickling room of their new mill. For Rodine has effected substantial savings in acid and metal, and enabled Rustless to produce a bright, smooth product.

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Defense Board Calls Scrap Meeting Jan. 6

Washington

• • • **Leon Henderson's price** stabilization division in the National Defense Advisory Commission has invited representatives of the Institute of Scrap Iron and Steel and the Waste Materials Dealers Association to a meeting on Jan. 6 to discuss recent price increases on iron and steel scrap.

The division decided to call in scrap representatives after conferring at an afternoon session on Dec. 19 with spokesmen for 11 steel companies representing both large and small producers. The meeting, also attended by members of the raw materials division of the defense commission, canvassed the demand for steel, scrap, pig iron and coke as well as supplies of scrap on hand at consuming plants, but it was understood that emphasis was placed upon recent price rises in scrap.

Further conferences are planned but no dates have been fixed for conferring with scrap suppliers, pig iron producers, and others who previously had met with members of the price stabilization division.

The Dec. 19 conference was represented as having been called largely as a result of efforts by small non-integrated companies to present to government people a situation which finds them faced with higher raw material prices on the one hand and a desire to maintain existing prices on finished steel on the other.

Just how far defense commission officials are prepared to go in the event further rises in raw material prices occur has not been disclosed but it has been indicated that the price stabilization division hopes that a further canvassing of the supply-demand picture will be adequate to allay apprehension in the steel industry. Officials are known to feel that with respect to scrap, described by them as the only raw material price tending generally to get out of line in the past few weeks, the upward price trend is largely the result of a speculative attitude and not justified by existing circumstances.

Scrap suppliers, distributers and consumers were called to Washington early in October under similar circumstances and government price observers have since expressed satisfaction over the results until recent price rises occurred in scrap. At that time it was believed that a broadening of the export license restrictions to cover all grades of scrap would among other factors tend to keep scrap prices at a stable level.

Now that the export license system has been further widened to include all iron and steel products and their raw materials, some official thought has been given to the indirect effect upon scrap prices. In some government quarters it is hoped that the price situation on scrap may be eased if the rate of steel ingot production could be reduced by as little as 3 per cent through effective enforcement of the recent export restrictions placed on iron and steel.

A defense commission statement on the Dec. 19 meeting said merely that "recent price developments in the steel and related industries" were reviewed at the session.

"It was pointed out that while prices of scrap, pig iron and coke changed little for nearly two months following a similar meeting on Oct. 8, they have moved upward during the past two weeks," the statement continued. "It also was noted that the price of finished steel for the first quarter of 1941 will remain the same as for the present quarter and for several previous quarters.

"It was agreed that steel makers cannot continue indefinitely to absorb the increased cost of raw materials entering into their product without ultimate reflection in a higher price of finished steel—a result which steel manufacturers do not desire.

"Dealers in scrap also are agreed they do not wish to see the price of that raw material increase and sellers of scrap who also are purchasers of finished steel desire to see scrap and steel prices held down. It therefore is apparent that all three groups involved—buyers, middle men and sellers—are anxious to avoid price increases."

Because of this fact, the price stabilization division wants to determine, if possible, which group has "lost its poise" since the Oct. 8 meeting.

In attendance at the Dec. 19 meeting in addition to Mr. Henderson were Walter S. Tower, president of the American Iron and Steel Institute and group executive on iron and steel products in the Raw Materials Division of the defense commission; W. A. Hauck, assistant group executive and former assistant to the president, Lukens Steel Co., Coatesville; C. A. Bishop, Mr. Henderson's executive assistant, and the following spokesmen for the steel industry:

L. B. Block, vice president, Inland Steel Co., Chicago; Walter Mathesius, United States Steel Corp., Pittsburgh; T. R. Akin, president, Laclede Steel Co., St. Louis, Mo.; J. C. Miller, vice president, American Rolling Mill Co., Middletown, Ohio; C. A. Ilgenfritz, manager, purchases and raw materials, Republic Steel Corp., Cleveland.

Wilbur Murphy, secretary, Weirton Steel Co., Weirton, W. Va.; Charles R. Holton, purchasing agent, Bethlehem Steel Co., Bethlehem, Pa.; R. W. Wolcott, president, Lukens Steel Co., Coatesville, Pa.; Albion Brindley, general purchasing agent, Pittsburgh Steel Co., Pittsburgh; G. L. Rathel, vice president and purchasing agent, Continental Steel Corp., Kokomo, Ind., and H. E. Pape, purchasing agent, Stanley Works, Bridgeport, Conn.

Canada To Expand Trenton Steel Works

• • • Officials of the Department of Munitions and Supply say that more than $3,000,000 will be spent enlarging the steel-making capacity of the Trenton Steel Works at Trenton, N. S. The department spokesman stated other projects of this kind could be expected later as Steel Controller H. D. Scully expands his program to augment steel production and conserve the supply in Canada. In the past two months announcements have been made here regarding capital expenditures by the government for expanding the country's steel and iron making facilities to value of more than $15,000,000.

Tightening of Control Over Labor, Industry Seen in Knudsen Warning

Washington

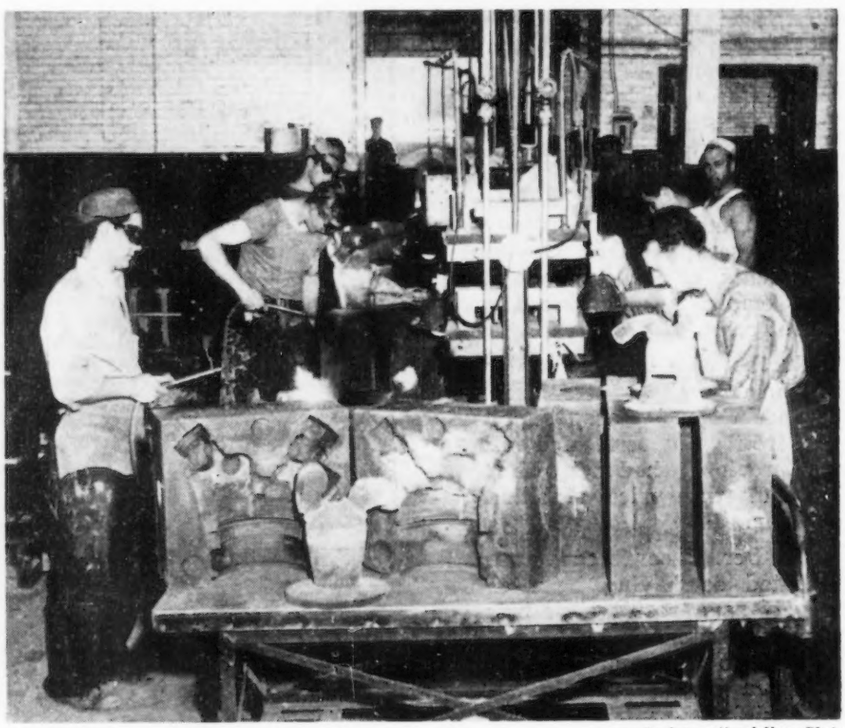
• • • **That further** tightening of government control over capital, industry and probably of labor appears to be inevitable is seen in the forceful and ominous warning of a world crisis "irreconciliable in character," not to be determined by means of appeasement—issued suddenly last Saturday in the name of William S. Knudsen as director of the Office for Production Management. Overall extension of a system of priorities, spreading of contracts to large and small capacity not now occupied on defense work and elimination of week-end labor "blackouts" are being freely predicted. The latter forecast is being made despite the insistence in administration circles on the maintenance of "social gains." It is likewise believed that where temporary "bottlenecks" in defense production are encountered civilian demands will have to be foregone, thus abandoning another pet conception of government economists of the business-as-usual school.

The Knudsen-signed OPM bomblike statement, urging the swiftest possible production of defense needs, was issued within less than 24 hr. after President Roosevelt announced his plan to establish the four-man "super-defense" board. Its formal creation remains to be done by executive orders. The statement was drafted at the OPM's first meeting and undoubtedly had administration approval. Otherwise the defense organization would not have ventured the pronunciamento, for it is grave and militant and has international implications. It was announced in the midst of growing tension between Washington and Berlin, significantly on the heels of Germany's blast implying a threat against the United States if this government turned German and Italian ships in American harbors over to England.

With a 20 to 40 per cent lag in the defense effort, the Knudsen statement called upon the people of the country to "pull off their coats and roll up their sleeves" and give undivided attention to the swiftest possible defense production. The statement gives dramatic reflection of the official view that neither industry, labor nor the nation generally is at all conscious of what is declared to be an increasingly dangerous international situation that is a challenge to democratic government. Appeal was made to sacrifice, sweat and for hard work, for the nation to awake from its comparative lethargy, to "shake off its drowsiness and take a cold shower," in the words of Donald M. Nelson, Defense Commission Coordinator of Purchases. All elements of the national life are the object of the statement, which is interpreted to mean that they have experienced none of the sacrifices that they will have to make if the defense job is to be done at all adequately.

As for industry it is insisted that there are sections whose reluctance to accept orders must be overcome quickly. Even more troublesome is the labor question over which there are conflicting views among top-ranking officials promoting the defense program. Solution of the problem has been made particularly serious by the White Houes policy of demanding that "social gains" be maintained.

Even as the OPM statement was issued, with his sanction as a member of the new "super-defense" board, CIO's Sidney Hillman was haggling with the War Department. He was insisting that War Department contracts carry a clause requiring contractors to conform to the Wagner act. Violators of the act would be barred from defense orders. Violators would be determined by the National Labor Relations Board, not by the courts. Other members of the OPM and the Defense Commisison are strongly opposed to the Hillman plan, realizing that it would sabotage the defense program. Yet reports are current that the War Department may have to yield to it. Obviously if it does, the Navy Department will have to follow suit.



By International News Photo

MOULDS AND CORES in the Wright Aeronautical Corp.'s new Fairlawn foundry, America's first line production foundry devoted exclusively to the moulding and casting of aluminum alloy cylinders for Whirlwind and Cyclone airplane engines for national defense, are pictured above.

1940 Steel Output In U. S. Highest Ever Recorded—66½ Million Tons

By WALTER S. TOWER

President, American Iron and Steel Institute

• • • **Production of steel** in the United States during 1940 reached the highest level ever recorded. More than 66,500,000 net tons of steel ingots (all grades)) were produced during the year, fully 8 per cent above the previous record figure of 61,400,000 tons for 1929, and nearly 27 per cent greater than the 1939 output of 52,500,000 tons.

Close to 18 per cent of the finished and semi-finished steel products produced for sale in 1940 was produced for the export trade, about half of which was destined for Great Britain. The steel industry operated during the year at an average of 82 per cent of its capacity.

In the final three months of the year, all existing records for the tonnage of steel production were broken as the industry maintained operations at an average close to 95 per cent of capacity.

Steelmaking capacity of the industry at the close of 1939 was rated at approximately 81,000,000 tons of ingots per year. That capacity was 15 per cent greater than could be produced with the equipment available at the close of 1929, and showed a gain of 38 per cent over the capacity at the end of 1918, compared with a population increase of 27 per cent over that period.

During the past ten years (years for the most part of low rate of production and poor earnings in the steel industry) total expenditures for plant modernization and expansion approximated $1,500,000. That policy of improving and enlarging is going on constantly and in the past year it has added substantially to ingot capacity, lifting the total to an estimated rated capacity of 83,000,000 net tons.

Actually, that "rated" capacity is about 10 to 12 per cent below maximum theoretical capacity because of allowances which steelmakers consider necessary to make for periodic repairs or unavoidable shut-down of furnaces. That is why, under pressure of great demand, steel companies frequently report operations at a rate in excess of their "rated" capacity.

Thus although its "rated" capacity now is about 83,000,000 tons of ingots per year, the practical working capacity for the industry is approximately 85,000,000 tons.

It is estimated that the new electric furnaces will have an aggregate annual capacity of about 900,000 tons of steel, which will increase by nearly 50 per cent the industry's electric furnace capacity as of the close of 1939.

Approximately 1,300,000 tons of additional capacity for producing open-hearth steel will be added as a result of programs now under way, exclusive of the substantial additions to capacity which are expected to result from enlargement of older furnaces.

Employment and payrolls in the industry during 1940 rose far above 1929 levels. An average of approximately 550,000 men were employed throughout the year, or nearly 20 per cent more than in 1929, and payrolls of $950,000,000 were 13 per cent above 1929 in spite of the current shorter work week.

Hourly wages of steel workers in 1940 were nearly 30 per cent higher than in 1929, and stood at the highest level in history.

Scrap Consumption in U. S. 41 Million Tons In 1940

• • • **Domestic consumption** of iron and steel scrap, one of the principal raw materials of steel mills, foundries, and blast furnaces for the manufacture of new iron and steel, soared to a record height in 1940 at approximately 41,000,000 gross tons, according to Edwin C. Barringer, executive secretary of the Institute of Scrap Iron and Steel Inc., New York.

This was an increase of 26 per cent over the 32,434,000 tons melted at home in 1939. It exceeded by a wide margin the previous record year of 1937, when consumption totaled 38,006,000 tons. It compared with the world war peak of 26,800,000 tons, in 1917.

Meanwhile, the export market for scrap narrowed, totalling only 2,800,000 tons, with the final two months of the year estimated. In 1939 exports reached 3,551,000 tons, while the peak export year of 1937 saw 4,092,000 tons of this important raw material shipped abroad.

Of the 41,000,000 tons of scrap consumed in 1940, approximately 19,000,000 tons was supplied by dealers while 22,000,000 tons was "home" scrap, that is, scrap available as a by-product in steel mills from the manufacturing process. Of the scrap made available by dealers, a preliminary estimate is that 5,000,000 tons was the by-product of converting steel into consumer goods, 3,500,000 to 4,000,000 tons was marketed by the railroads, 2,500,000 to 3,000,000 tons came from the wrecking of old automobiles, while the remainder was the toll taken by obsolescence in buildings, bridges, manufacturing equipment, and maintenance.

Probably the greatest increase in the production of scrap in 1940—production being used advisably because scrap is a by-product and is not produced as such—was at press plants where automobile bodies and fenders, containers, and all manner of light steel are compressed into bundles for use in the steel furnace. Up to several years ago, city dumps and country ravines were filled with cast-off light scrap, but the industry is now reclaiming this material and making it available for remelting. Over 1,000,000 tons of scrap originated in this source in 1940.

With the export market for scrap seriously curtailed in 1940, both by the war and by government embargo, new trade movements begin to develop. Gulf Coast scrap started to move by barge from Texas points to the Pittsburgh district. An all-water shipment from Gulf ports to eastern Pennsylvania mills was initiated. Atlantic Coast consumers of scrap transported material by ocean-going barges from New England points.

Government Awards

Government awards during the week ended Dec. 14, according to the Division of Public Contracts, Department of Labor, follow:

Iron and Steel Products

Albert & Davidson Pipe Corp., Brooklyn, N. Y.; steel pipe, $13,539.

Alemite Co. of Maryland, Baltimore; fittings, $19,824.

American Fork & Hoe Co., Cleveland, Ohio; axes, $23,150.

Armstrong Bros. Tool Co., Chicago, wrenches, $17,852.

Associated Piping & Eng. Co., Ltd., Los Angeles; piping, $23,806.

Austral Sales Corp., New York; screen guards, $10,742.

Baldt Anchor, Chain & Forge Corp., Chester, Pa.; steel anchors, $20,700.

Berkeley Steel Const. Co., Inc., Berkeley, Cal.; buoys, $45,360.

Bethlehem Steel Co., Bethlehem, Pa.; steel, $19,334.

Bowen Products Corp., Auburn, N. Y. fuze covers, $20,781.

Briggs Manufacturing Co., Detroit, Mich.; steel bath tubs, $475,852.

J. C. Busch Co., Milwaukee, Wis.; multiplex tables, $32,200.

Carrollton Metal Prod. Co., Carrollton, Ohio; cake covers, $12,976.

Columbia Steel Co., Washington; anchors, $43,200.

Crown Iron Works Co., Minneapolis, Minn.; bridge equipment, $331,740.

Crucible Steel Co. of America, New York; projectiles, $40,912.

Crucible Steel Company of America, New York; forged bars, $13,010.

Crucible Steel Co. of America, New York; forgings, $64,890.

Crucible Steel Co. of America, New York; steel, tool, $13,920.

Doehler Die Casting Co., Toledo, Ohio; nozzles, $43,968.

Duff-Norton Mfg. Co., Pittsburgh, Pa.; jacks, $11,412.

Franklin Hardware Co., New York; bolts and nuts, $15,570.

Harnischfeger Corp., Milwaukee, Wis.; bridge cranes, $175,388.

IDL Mfg. & Sales Corp., New York; shears, $30,500.

Ingersoll-Rand Company, New York; air drills, $11,643.

Keystone Bolt & Nut Corp., New York; blades, files, $13,604.

Leach Bros., Oshkosh, Wis.; bridge equipment, $681,500.

Lord & Burnham Co., Irvington, N. Y.; footbridges, $407,524.

Mall Tool Co., Chicago; band saws, $211,500.

Manning, Maxwell & Moore, Inc., Jersey City, N. J.; handles, $36,372.

Master Metal Products, Inc., Buffalo, N. Y.; steel chest, $12,323.

Mercury Aircraft, Inc., Hammondsport, N. Y.; wrenches, $18,900.

Midvale Co., Washington; forgings, $26,775.

Montgomery & Co., Inc., New York City; hand drills, $12,204.

National Supply Company, Toledo, Ohio; forgings, $12,726.

Niagara Motors Corp., Dunkirk, N. Y.; forgings, 28,359.

North & Judd Mfg. Co., New Britain, Conn.; slides, loops, $30,517.

Ohio Injector Co., Wadsworth, Ohio; valves, $37,246.

Pacific Wire Rope Co., Los Angeles, Cal.; wire rope, $11,882.

Pennsylvania Forge Corp., Philadelphia; forgings, $164,785.

Plomb Tool Co., Los Angeles, Cal.; wrenches, $12,072.

Quality Buckle Co., Providence, R. I.; buckles, $31,961.

Republic Steel Corp., Cleveland, Ohio; steel, $16,281.

John A. Roebling's Sons Co., Philadelphia; wire rope, $22,045.

Sause Structural Steel Co., Youngstown, Ohio; structural steel, $16,500.

Snead & Co., Jersey City, N. J.; bridge equipment, $1,063,050.

Stanley Works, New Britain, Conn.; valve guards, $50,643.

Steel Improvement & Forge Co., Cleveland; forgings, $47,032.

Stupp Bros. Bridge & Iron Co., Los Angeles; trashracks, $50,388.

Taylor-Parker Co., Inc., Norfolk, Va.; drills, $24,263.

Truscon Steel Co., Columbus, Ohio; steel doors, $22,316.

United States Pipe & Foundry Co., Los Angeles; cast iron pipe, $11,343.

Virginia Bridge Co., Roanoke, Va.; bridge and parts, $155,453.

Washburn Co., Worcester, Mass.; wire clamps, $10,364.

Waterbury Buckle Co., Waterbury, Conn.; buckles, $43,276.

Williamson Heater Co., Cincinnati; furnaces, $38,885.

Wyckoff Drawn Steel Co., Pittsburgh, Pa.; steel, $31,758.

Youngstown Pressed Steel Div. Mullins Mfg. Corp., Warren, Ohio; steel bath tubs, $53,400.

Zephyr Laundry Mach. Co., Inc., Chicago; truck tubs, $44,852.

Other Machinery

American Mach. & Metals, Inc., E. Moline, Ill.; washers & ironers, $505,579.

Brown & Sharpe Mfg. Co., Providence, R. I.; screw machine, $10,046.

Carlton Machine Tool Co., Cincinnati; drills, $21,334.

Cincinnati Milling Mach. & Cincinnati Grinders, Inc., Cincinnati, Ohio; grinders, $83,342.

Cincinnati Shaper Co., Cincinnati; press machines, $19,244.

Clayton Mfg. Co., Alhambra, Cal.; cleaners, $25,222.

Clearing Machine Corp., Chicago; press brake, $14,200.

Eichman Machinery Co., Kansas City, Mo.; milling machine, $18,634.

Ex-Cell-O Corp., Detroit; grinder, $15,958.

Gisholt Machine Co., Madison, Wis.; lathes, $107,397.

Huebsch Mfg. Co., Milwaukee; presses; $31,240.

International Harvester Co., Chicago; tractors, $33,562.

Iowa Manufacturing Co., Cedar Rapids, Iowa; crushing plant, $28,375.

Byron Jackson Co., Huntington Park, Cal.; recoil mechanism, $2,643,709.

Jensen Mfg. Co., Palmyra, N. Y.; washers, $78,220.

Jones & Lamson Machine Co., Springfield, Vt.; lathe, $10,241.

Le Roi Co., Milwaukee; generating units, $180,270.

Lloyd & Arms, Inc., Philadelphia; lapping machine, $11,940.

McDonald Machinery Co., St. Louis; shapers, $16,065.

Motch & Merryweather Machine Co., Cleveland; grinders, $61,900.

Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn.; radial drills, $25,240.

Racine Tool & Machine Co., Racine, Wis.; hack saw, $14,762.

Sebastian Lathe Co., Cincinnati; lathes, $177,641.

Seifreat-Elstad Mach. Co., Dayton, Ohio; shapers, $16,578.

Wm. Sellers & Co., Inc., Philadelphia; grinders, $11,405.

Wm. Sellers & Co., Inc., Philadelphia; boring machine, $16,845.

W. E. Shipley Machinery Co., Philadelphia; turning machines, $45,112.

Singer Sewing Machine Co., New York; sewing machines, $35,420.

Smith, Drum & Co., Philadelphia; ironers, $43,722.

Sterling Engine Co., Buffalo, N. Y.; propulsion plants, $652,800.

Swind Machinery Co., Philadelphia; shears machines, $62,673.

Unipress Co., Inc., Minneapolis; pressers, $120,035.

Vandyck Churchill Co., Philadelphia; milling machines, $14,971.

J. R. Walraven, Atlanta, Ga.; lathes, $18,995.

Warner & Swasey Co., Cleveland; lathes, $18,467.

Weaver Mfg. Co., Springfield, Ill.; engine hoists, $84,000.

Albert Weiss, New York; machines, $11,849.

Wiedemann Machine Co., Philadelphia; machines, $58,256.

Non-Ferrous Metals & Alloys

Aluminum Co. of America, Washington; aluminum rivets, $11,612.

American Brass Co., Waterbury, Conn.; seamless bands, $76,123.

American Brass Co., Waterbury, Conn.; copper-nickel tubing, $197,055.

American Brass Co., Waterbury, Conn.; cartridge cups, $215,364.

American Brass Co., Waterbury & Ansonia, Conn.; copper, brass, $13,765.

Anaconda Sales Co., New York; copper ingots, $14,610.

Chase Brass & Copper Co., Inc., Waterbury, Conn.; brass, $12,554.

C-O-Two Fire Equipment Co., Newark, N. J.; extinguishers, $50,580.

Foster Wheeler Corp., New York; brass pipe, $176,962.

Fyr Fyter Co., Dayton, Ohio; fire extinguishers, $43,600.

Kennecott Sales Corp., New York; copper, $60,250.

Metal Reduction Corp. of N. J., North Bergen, N. J.; ingot bronze, $28,782.

National Lead Co., Baltimore Branch, Baltimore, metal, $21,510.

Phelps Dodge Copper Products Corp., New York; brass pipe, $12,657.

Revere Copper & Brass, Inc., Baltimore, cartridge cases, $125,199.

Revere Copper & Brass, Inc., Balt. Div., Baltimore; cartridge discs, $58,599.

Revere Copper & Brass, Inc., Balt. Div. Baltimore; reworking scrap, $72,816.

Scovill Mfg. Co., Waterbury, Conn.; condenser tubes, $93,814.

Scovill Mfg. Co., Philadelphia; 5-cent blanks, $107,500.

United-Carr Fastener Corp., Cambridge, Mass.; buttons, washers, clips, $25,404.

United States Steel Export Co., Washington; fabricated plates, $85,943.

Navy Department of Supplies and Accounts

Aero Instrument Co., Cleveland; heads & bases, pelorus-drift sight, $6,250.

Alban Tractor Co., Inc., Baltimore; crane, $13,758.

American Chain & Cable Co., Inc., American Cable div., Wilkes-Barre, Pa.; jackstays; pendants; lines, release & recovery, $330,678.

American Fork & Hoe Co., Cleveland; adzes, hatchets, and hammers, $39,084.

American Metal Co., Ltd., New York; tin, pig, $101,626.

American Scale Co., Kansas City, Mo.; vises, machinists', $12,712.

American Smelting & Refining Co., New York; lead, pig, $55,500.

American Steel & Wire Co. of N. J., Washington; cable, electric, $97,179.

Anaconda Wire & Cable Co., Washington; cable, electric, $99,071.

Antonelli Fireworks Co., Inc., Rochester, N. Y.; signals, miniature practice bombs, $18,889.

Austin-Hastings Co., Inc., Cambridge, Mass.; machines, drilling, upright, $19,283.

Bethlehem Steel Co., New York; wheels, turbine; nozzles, turbine, $42,500.

Birtman Electric Co., Rock Island, Ill.; vises, machinists', $9,320.

Brewster Aeronautical Corp., Long Island City, N. Y.; airplanes, $15,160,501.

Chas. D. Briddell, Inc., Crisfield, Md.; cleavers, butchers', $11,707.

B. B. Buell & Co., Seattle; ranges, oil burning, $7,770.

B. B. Buell & Co., Seattle; ovens, food-baking, electric, $6,453.

Buffalo Foundry & Machine Co., Buffalo, N. Y.; tank, impregnating, $5,829.

Bullard Co., Bridgeport, Conn.; machine, boring mill, $14,387.

Burndy Engineering Co., Inc., New York; connectors, terminal solderless, $9,523.

Burrows Filing Co., Inc., New York; weights, paper, iron, $5,626.

Carey Machinery & Supply Co., of Baltimore City, Baltimore, Md.; lathes, engine, $11,415.

Caswell, Strauss & Co., Inc., New York; tin, pig, $101,666.

Chase Brass & Copper Co., Inc., Waterbury, Conn.; bronze, rods; brass, naval & commercial; tubing, brass, $49,050.

Clyde Cutlery Co., Clyde, Ohio; knives, boning & butchers, $20,175.

Collyer Insulated Wire Co., Pawtucket, R. I.; cable, electric, $96,473.

Crucible Steel Co. of America, New York; steel, slab, $11,385.

Dana Tool-D Nast Machinery Co., Philadelphia; vises, machinists, $6,651.

DeLaval Steam Turbine Co., Trenton, N. J.; pumps, $1,350,000.

Delaware Tool Steel Corp., Wilmington, Del.; blanks, chisel; chisels, pneumatic tool, $5,941.

Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.; generators, motors & regulators, $86,800.

Edison General Electric Appliance Co. Inc., Chicago; ranges, electric, $5,043.

Marshall Field & Co., Mfg. Div., Spray, N. C.; blankets, wool, $186,900.

General Cable Corp., Washington; cable, electric, $97,564.

General Cable Corp., Washington; cut cable electric, $95,974.

General Electric Co., Schenectady, N. Y.; cable, electric, $98,685.

Gisholt Machine Co., Madison, Wis.; lathes, turret, $48,773.

Gleason Works, Rochester, N. Y.; generator, $8,205.

Greenville Steel Car Co., Greenville, Pa.; cars, box, railroad, $105,188.

Grumann Aircraft Engineering Corp., Bethpage, L. I., N. Y.; airplanes & spare parts, $36,230,455.

Haffner-Thrall Car Co., Chicago; cars, flat, railroad, $58,097.

Russell Harrington Cutlery Co., Southbridge, Mass.; knives; steels, butchers, $37,375.

Ingersoll-Rand Co., New York; wrenches, pneumatic, $6,090.

Jenison Machinery Co., San Francisco, Cal.; drill, multiple, spindle, $8,965.

Kester Solder Co., Chicago; solder, tin-lead, $6,703.

Lamson & Goodnow Mfg. Co., Shelburne Falls, Mass.; forks, cooks; knives, sabatier, $13,900.

Thomas Laughlin Co., Portland, Ore.; shackles, $7,214.

Lloyd & Arms, Inc., Philadelphia; machine, honing & lapping, $35,690.

McKay Co., Pittsburgh; chains; rings; & bails, anchor, $162,848.

Monarch Machine Tool Co., Sidney, Ohio; lathe, engine, $9,544.

National Electric Products Corp., Pittsburgh; cable electric, $96,540.

North American Smelting Co., Philadelphia; solder, tine-lead, $25,893.

Northern Pump Co., Minneapolis, Minn.; pumps, diesel oil fuel, $21,665.

Okonite Co., Passaic, N. J.; cable, electric, $97,760.

Phelps Dodge Copper Products Corp., Habirshaw Cable & Wire Div., New York, N. Y.; cable, electric, $349,122.

Fayette R. Plumb, Inc., Philadelphia; axes, hammers, hatchets, mauls & sledges, $11,494.

Pratt & Whitney Division of Niles-Bement-Pond Co., West Hartford, Conn.; shaper, vertical, universal; $7,472.

Providence Mill Supply Co., Providence, R. I.; vises, machinists, $31,987.

C. J. Rainear & Co. Inc., Philadelphia; flanges, steel, $18,724.

Republic Steel Corp., Cleveland, Ohio; steel, bar, $5,279.

Richardson Co., Melrose Park, Ill.; material, insulating, $8,970.

Rockbestos Products Corp., New Haven, Conn.; cable electric, $99,248.

Wm. Scrimgeour, Washington, D. C.; knives, spatula, $5,059.

Seattle Chain Mfg. Co., Seattle; chain, $6,006.

W. E. Shipley Machinery Co., Philadelphia, Pa.; machine, boring, drilling & milling, $59,700.

Stetson-Ross Machine Co., Seattle; machine, woodworking, $11,875.

Thwing-Albert Instrument Co., Philadelphia; heads & bases, pelorous-drift sight, $72,700.

Timken Roller Bearing Co., Steel & Tube Div., Canton, Ohio; tubing, steel, molybdenum alloy, $19,061.

Theo. C. Ulmer, Inc., Philadelphia; vises, combination; woodworkers', $5,416.

United Aircraft Corp., United Airport Div., East Hartford, Conn.; material to rebarrel cylinders, $269,247.

United States Gypsum Co., Chicago; metal, expanded, steel, $16,416.

Warner & Swasey Co., Cleveland; lathes, turret, $34,500.

Welsh Mfg. Co., Providence, R. I.; screwdrivers, $8,412.

Westinghouse Electric & Mfg. Co., Washington; blading, turbine, $59,980.

Worthington Pump & Machinery Corp., Washington; pumps, turbine driven, $78,716.

Youngstown Welding & Engineering Co., Youngstown, Ohio; boxes, water, $83,107.

Harrisburg Steel Corp., Harrisburg, Pa.; cylinders, compressed gas, shatter-proof, $54,070.

Heald Machine Co., Worcester, Mass.; grinders, internal, $19,153.

Heald Machine Co., Worcester, Mass.; machine, grinding, $6,419.

Indian Motorcycle Co., Springfield, Mass.; motorcycles with package trucks, $29,035.

International Nickel Co., Inc., New York; alloy, nickel-copper, $31,182.

International Nickel Co., Inc., New York; alloy, nickel-copper-aluminum, $13,670.

International Nickel Co., Inc., New York; alloy, nickel-copper, $12,550.

Kennecott Sales Corp., New York; copper, ingot, $225,439.

Lodge & Shipley Machine Tool Co., Cincinnati; lathes, engine, $77,325.

Lyon Metal Products, Inc., Aurora, Ill.; shelving, for engine overhaul and aircraft maintenance shop, $7,648.

Mine Safety Appliances Co., Pittsburgh; valves, cylinder, oxygen, $9,100.

Mine Safety Appliance Co., Pittsburgh; indicators, hydrogen gas, $7,936.

Monarch Machine Tool Co., Sidney, Ohio; lathes, precision, $11,866.

James M. Motley & Co., Inc., New York; lathe, metal, engine, $9,135.

James M. Motley & Co., Inc., New York; shear, rotary, $20,995.

National Forge & Ordnance Co., Washington; crankshafts, steel, $12,250.

National Lead Co., Baltimore; lead, sheet, $30,569.

National Tube Co., Washington; tubes, boiler, $57,722.

Noland Co., Inc., Washington; fixtures, plumbing, $17,915.

Northwest Lead Co., Seattle; lead, sheet, $13,408.

Norton Company, Worcester, Mass.; machine, grinding, $6,175.

The Okonite Co., Passaic, N. J.; cable, electric, $27,814.

Orton Crane & Shovel Co., Chicago; crane, locomotive, $13,087.

Phelps Dodge Copper Products Corp., Habirshaw Cable & Wire Div., New York; cable, electric, $64,448.

Phelps Dodge Copper Products Corp., Habirshaw Cable & Wire Div., New York; wire, copper, $196,300.

G. E. Prentice Mfg. Co., New Britain, Conn.; fasteners, automatic, $26,445.

Roberts Numbering Machine Co., Brooklyn, N. Y.; machines, numbering, automatic, $8,250.

Rockford Machine Tool Co., Rockford, Ill.; planer, double housing, $30,521.

Rohm & Haas Co., Philadelphia; plastic, transparent, flame-resisting, $106,050.

Scovill Mfg. Co., Waterbury, Conn.; tubing, copper-nickel alloy, $10,778.

Timken Roller Bearing Co., Steel & Tube Div., Canton, Ohio; steel, nickel, bar, $38,661.

War Department

Aviation Manufacturing Corp., Williamsport, Pa.; aircraft engine plant, $1,507,491.

Fairchild Airplane & Engine Corp., Hagerstown Md.; additions to existing plant and new plant $982,890.

Alban Tractor Co., Marion, Ohio; shovels ½-cu. yard, $341,066.

American Locomotive Co., Schenectady, N. Y.; locomotives, $121,600.

Barwood & Co., Philadelphia; gages, $5,837.

Bendix Aviation Corp., Julien P. Friez & Sons Div., Baltimore; fire control equipment, $25,000.

Continental Motors Corp., Detroit; engines, $47,944.

Crucible Steel Co. of America, New York; small arms material, $4,023.

Crucible Steel Co. of America, New York; steel, nickel chromium, $13,010.

Fidelity Machine Co., Philadelphia; shearing machines, $2,370.

Goodman Mfg. Co., Chicago; artillery material, $428,715.

Harley Davidson, Milwaukee; motorcycles, $1,000.

Hercules Powder Co., Kenvil Plant, Kenvil, N. J.; ammunition components, $1,610.

Lincoln Park Tool & Gage Co., Lincoln Park, Mich.; gages, $11,466.

Mack Holding Co., Inc., Wayne, N. J.; ammunition components, $15,820.

Mack International Truck, Long Island City; trucks, $17,500.

Micromatic Hone Corp., Detroit; machines, $2,668.

Moto-Scoot Mfg. Co., Chicago; rails, $80,119.

Oliver Iron & Steel Corp., Pittsburgh; artillery material, $1,947.

Otis Elevator Co., Buffalo, N. Y.; steel castings, $25,880.

Burt Calls for Orderly Machine Tool Program

West Hartford, Conn.

• • • **Immediate and proper** analysis of defense requirements for machine tools was called for on Monday, Dec. 23, by C. R. Burt, chairman of the defense committee of the National Machine Tool Builders Association and president of Pratt & Whitney Division, Niles-Bement-Pond Co. "We have stated repeatedly that industry must be given a well-defined program and an orderly delivery schedule based on the order of importance," Mr. Burt said in commenting on the recent appeal for accelerated machine tool production by William S. Knudsen, production head of the National Defense Commission.

He cited instances where machines had been rushed to completion and then been permitted to stand in warehouses "waiting for some other part of the program to catch up."

"Iron out this sort of thing—place the machines intelligently where they can go to work at once—and we can speed up everything right away," Mr. Burt asserted.

He outlined three factors demanding immediate consideration:

"1. Give Mr. Knudsen authority, and with his knowledge of production . . . he will get results.

"2. The government must prepare a program of its requirements and state the order of importance for deliveries.

"3. Orders for machine tools required in 1942 should be placed at once with an orderly schedule of deliveries."

More Restrictions On Exports Forecast

Washington

• • • **Lieut. Col.** Russell L. Maxwell, administrator of export control, forecast last week that on the basis of existing studies additional export restrictions will be necessary under the new export control law. Without particularizing, Colonel Maxwell reported that from May through October over $250,000,000 worth of licensed goods, or 20 per cent of the total exports, have been shipped under export license.

This means, according to Colonel Maxwell, that these products were shipped with full knowledge that defense needs had priority. For the first four months of operations under the export control statute approximately 25,000 licenses were issued, his figures showed. These covered over $800,000,000 worth of products. Total value of goods represented by rejected applications was placed at $112,000,000.

Although he attempted no breakdown by products, Colonel Maxwell said that his division has no problems receiving closer attention that are machine tools. His job in this respect, he explained, is further complicated by the large number of types but that machine tool experts are working closely with Army, Navy and National Defense Advisory Commission representatives.

Priority Control for Defense Contractors

Washington

• • • **Further evidence** of the Administration's efforts to step up defense production was seen in an executive order of Dec. 15 extending priority control to subcontractors. The order broadens one which was issued on Oct. 22, authorizing the National Defense Advisory Commission Priorities Board to recommend and invoke priorities, if necessary, on primary contractors engaged on Navy and Army work. The latest order goes beyond that scope and encompasses "all orders" authorized under the act of June 28 giving defense orders priority over all deliveries for private account or for export.

Cleveland Companies Distribute Bonuses

Cleveland

• • • **National Acme Co.,** Cleveland machine tool builder, paid a cash bonus Dec. 24 to shop and office employees based upon a definite scale of each worker's earnings for the year 1940.

Warner & Swasey Co., Cleveland, producer of turret lathes, has given two weeks' pay to all hourly paid employees who were employed prior to Jan. 1, 1940. To those employees who began work between Jan. 1, 1940, and Oct. 1, 1940, one week's pay was given. These bonuses are in addition to the one-week vacation bonus paid by Warner & Swasey in July.

Numerous other companies in the Cleveland area also paid bonuses. The list includes:

Clark Controller Co., which distributed 15 per cent of the company's net profit for the year among 400 employees based on years of service.

Reliance Electric & Engineering Co., which paid bonuses to 674 shop and office employees based on the length of service of each employee and the company's average monthly sales billed for the concluding four months of 1940.

Cleveland Hobbing Machine Co. paid a bonus equivalent to one week's wages to 150 employees and shortened working days before Christmas and New Year's.

Cleveland Graphite Bronze Co. distributed Christmas bonuses totaling $48,000 among 2400 employees.

Scrap Consumption Tapers in November

• • • **Domestic consumption** of iron and steel scrap declined slightly in November, entirely because of the short month and the Thanksgiving holiday, according to the Institute of Scrap Iron and Steel Inc., New York. November consumption. at 3,922,000 gross tons, compared with the all-time record of 4,233,000 tons in October, and 3,858,000 tons in November, 1939, according to the Institute's estimate.

166 Defense Contracts Assigned For Loans

Washington

• • • **Donald M. Nelson,** director of small business activities for the National Defense Advisory Commission, reports that since Oct. 10—the effective date of the law which for the first time permits the assignment of government contracts—166 defense contracts have been assigned to local banks as security for loans made necessary by plant expansion.

Figures furnished THE IRON AGE show that these contracts range from $12,000,000 down to $1,000. Total value of contracts assigned to date under the new law is not known, but Mr. Nelson's division emphasizes that holders of defense contracts should consult their local banks or the nearest office of the Federal Reserve System for further information on loans.

Because of the confidential nature of some Army and Navy contracts, their assignment is prohibited by contract provision. In these cases, however, the contractor is entitled to a maximum advance amounting to 30 per cent of the total amount of the contract, plus progress payments distributed over the life of the contract, plus an additional advance upon delivery.

The contract assignment bill was passed by Congress late in September, and was signed by President Roosevelt on Oct. 9. It became effective Oct. 10. In a move designed to safeguard the contractor against delay, inconvenience and possible impairment of the assignment, the Treasury Department's procurement division on Nov. 25 outlined the procedure to be followed by the contractor and the lending institution under the new law.

Mall Tool Co. Buys Republic Tack Plant

Chicago

• • • **Purchasing the** former tack manufacturing plant of the Republic Steel Corp., the Mall Tool Co. will increase production about 25 per cent. About $100,000 will be spent for new equipment, including automatic tool grinders and boring machines. The firm manufactures portable power tools.

Personals

Change is inevitable in progressive Industry. Change is constant.

• **William C. Hogg** has been appointed assistant to general superintendent, Carnegie-Illinois Steel Corp.'s Homestead, Pa., works. He previously was assistant superintendent of open hearth departments at Homestead.

Mr. Hogg, a graduate of Sheffield Scientific School, Yale University, entered the steel industry as a laborer in the open hearth department at Homestead in 1925 and his experience subsequently included service as cinder pitman, second helper, melter foreman, foundry furnace foreman, labor foreman, assistant superintendent and departmental superintendent. He was made assistant superintendent of open hearth departments June 1, 1940.

• **Addison F. Vars,** who has been executive vice-president of Sterling Engine Co., Buffalo, N. Y., for over a year, has been elected president, succeeding **Spencer H. Logan,** who has been made chairman of the board. **Charles A. Criqui,** formerly chairman, has been made vice-chairman. **Edward H. Townsend,** formerly a member of a firm of consulting engineers and identified with Sterling Engine Co. for the past year, has been elected executive vice-president and treasurer. Mr. Vars became identified in an executive capacity with the company in 1926, upon the death of his father, who was one of the founders of the company.

• **Howard Stevens** has been appointed sales representative of the Wheeling district sales division of Wheeling Steel Corp., to be located at Columbus, Ohio.

• **George Spengler,** presently employed in the tubular sales division at Wheeling, is to be transferred to the Buffalo district sales office as a traveling representative. Both of these appointments are to be effective Jan. 1.

• **Tucker G. Stover,** formerly assistant purchasing agent of Western Electric Co., Inc., New York, has been appointed purchasing agent in charge of outside plant material and non-ferrous metals for the Bell System, succeeding **Charles A. Merrill,** who retires on Dec. 31. He has been associated with the company since 1921. **J. J. McKenna** will be in charge of purchases of non-ferrous metals. **Kingsley Gernon,** for the past 11 years in charge of buying at the company's Point Breeze (Md.) plant, comes to New York to become assistant purchasing agent; and his place at Point Breeze will be taken by **H. G. Ross.** Besides Mr. Gernon, three other assistant purchasing agents have been appointed. All three, **Leroy Peters, Stanley Johnson** and **Warren Johnson,** have had at least 15 years of experience with Western Electric.

• **Douglas F. G. Eliot** continues as general purchasing agent for the Western Electric Co.

• **D. W. Ellsworth,** formerly editor of the *Annalist,* has been made editorial assistant to **Virgil Jordan,** president of the National Industrial Conference Board.

• **Leon Steinberg,** of the Charleston Steel & Metal Co., Charleston, S. C., has been elected president of the Southern chapter of the Institute of Scrap Iron and Steel. **W. Alec Rawls,** of the wrecking company of the same name, Rocky Mount, N. C., has been elected first vice-president; **Mauray I. Cohen,** of Harry Harris & Co., Jacksonville, Fla., is second vice-president, and **W. Douglas Knight,** of J. T. Knight & Sons, Atlanta, Ga., is third vice-president.

• **Leo Uridil** has been appointed personnel manager for the new Curtiss-Wright airplane factory at Port Columbus, Ohio.

• **Edward A. France, Jr.,** who since 1936 has been Ohio representative of Standard Statistics Co., Inc., with headquarters in Cleveland, has been appointed by Leon Henderson, National Defense Commissioner, as a technical man on steel prices. He will leave for Washington early in January. Mr. France is a graduate of the Wharton School of Finance at Philadelphia and from 1932 to 1936 was Pittsburgh editor of *Steel.* He has obtained a leave of absence from Standard Statistics.

• **William J. Sullivan,** who was secretary to **James A. Farrel** when the latter was president of the United States Steel Corp., has engaged in the iron and steel export business with office at 245 Seventh Avenue, New York. For some time past he has been associated in the same line of business with C. H. Coulier & Co., 120 Liberty Street, New York.

• **Henry E. Beyster,** associated with General Motors Corp. as building designer for nearly 20 years, and formerly Detroit Commissioner of Public Works, has purchased the interest of **C. A. Handeyside** and **John Earnshaw** of the C. A. Handeyside Construction Co. The name of the company has been changed to H. E. Beyster Corp. with offices in the General Motors Building, Detroit. The firm will discontinue work as a construction company and will specialize as architects and engineers in designing and supervising construction in industrial fields. Mr. Beyster is president and general manager. Chief engineer of the company will be **Richard H. Krueger,** chief draftsman will be **Fred O. Schroeder,** at one time head of the architectural division of the University of Michigan. **Ronald C. Linton** will be in charge of structural engineering. Also associated with the organization are **Raymond C. Perkins, John Kasurin** and **U. U. Woodhouse, Leslie G. Larkin, Carl S. Barry, Julius C. Peter** and **Jules G. Hoffman,** who will be assistant general manager.

• **Harry A. Isaacs,** of American Iron & Supply Co., Minneapolis, has been elected president of the Northwest chapter of the Institute of Scrap Iron and Steel, Inc. **Max Schwartzman,** of Anoka, Minn., has been chosen first vice-president; **Harry Schnitzer,** of Schnitzer Iron & Metal Co., St. Paul, second vice-president; **Israel C. Mark,** of Mark Iron & Metal Co., Minneapolis, secretary; **Maurice Effress,** of Effress & Co., St. Paul, treasurer.

The Iron Age Comparison of Prices

Advances Over Past Week in Heavy Type; Declines in Italics

	Dec. 23, 1940	Dec. 16, 1940	Nov. 26, 1940	Dec. 26, 1939
Flat Rolled Steel:				
(Cents Per Lb.)				
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Tin and Terne Plate:				
(Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Manufacturing ternes	4.30	4.30	4.30	4.30
Bars and Shapes:				
(Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Wire and Wire Products:				
(Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails:				
(Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel:				
(Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Wire Rods and Skelp:				
(Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

	Dec. 23, 1940	Dec. 16, 1940	Nov. 26, 1940	Dec. 26, 1939
Pig Iron:				
(Per Gross Ton)				
No. 2 fdy., Philadelphia	$25.84	$24.84	$24.84	$24.84
No. 2, Valley furnace	24.00	23.00	23.00	23.00
No. 2, Southern Cin'ti	23.06	23.06	23.06	23.06
No. 2, Birmingham	19.38	19.38	19.38	19.38
No. 2, foundry, Chicago†	24.00	23.00	23.00	23.00
Basic, del'd eastern Pa.	25.34	24.34	24.34	24.34
Basic, Valley furnace	23.50	22.50	22.50	22.50
Malleable, Chicago†	24.00	23.00	23.00	23.00
Malleable, Valley	24.00	23.00	23.00	23.00
L. S. charcoal, Chicago	30.34	30.34	30.34	30.34
Ferromanganese‡	120.00	120.00	120.00	100.00

†The switching charge for delivery to foundries in the Chicago district is 60c per ton. ‡For carlots at seaboard.

Scrap:				
(Per Gross Ton)				
Heavy melt'g steel, P'gh.	$22.75	$22.75	$22.00	$18.25
Heavy melt'g steel, Phila.	20.75	20.75	20.75	18.50
Heavy melt'g steel, Ch'go	20.75	20.50	20.50	16.25
Carwheels, Chicago	21.75	21.75	21.00	15.75
Carwheels, Philadelphia	23.25	23.25	23.25	20.25
No. 1 cast, Pittsburgh	22.75	22.75	22.25	19.25
No. 1 cast, Philadelphia	23.75	23.25	23.25	20.75
No. 1 cast, Ch'go (net ton)	19.25	19.25	18.00	14.25
Coke, Connellsville:				
(Per Net Ton at Oven)				
Furnace coke, prompt	$5.50	$5.50	$5.25	$5.00
Foundry coke, prompt	5.75	5.75	5.75	5.75
Non-Ferrous Metals:				
(Cents per Lb. to Large Buyers)				
Copper, electro., Conn.*	12.00	12.00	12.00	12.50
Copper, Lake, New York	12.00	12.00	12.00	12.50
Tin (Straits), New York	50.10	50.05	50.375	50.25
Zinc, East St. Louis	7.25	7.25	7.25	6.00
Lead, St. Louis	5.35	5.35	5.65	5.35
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

*Mine producers only.

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 93-102 herein.
On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Composite Prices

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Dec. 23, 1940	2.261c. a Lb.	$23.44 a Gross Ton	$21.42 a Gross Ton
One week ago	2.261c. a Lb.	$22.61 a Gross Ton	$21.33 a Gross Ton
One month ago	2.261c. a Lb.	$22.61 a Gross Ton	$21.00 a Gross Ton
One year ago	2.261c. a Lb.	$22.61 a Gross Ton	$17.67 a Gross Ton

	FINISHED STEEL High	FINISHED STEEL Low	PIG IRON High	PIG IRON Low	SCRAP STEEL High	SCRAP STEEL Low
1940	2.261c., Jan. 2	2.211c., Apr. 16	$23.44, Dec. 23	$22.61, Jan. 2	$21.42, Dec. 23	$16.04, Apr. 9
1939	2.286c., Jan. 3	2.236c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.236c., May 28	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Summary of the Week

• Speeding up of defense program and further aid to Britain will bring repercussions in steel and machine tool industries . . . Large additional volume of ship work placed . . . Pig iron market now generally $1 higher . . . Scrap prices to be probed again.

EFFORTS of the National Administration to speed up the defense program and aid to Great Britain will soon have important repercussions in the steel industry and its metal-working branches.

Organization by the President of a four-man "super-defense board," to be known as the Office for Production Management, was immediately followed by an appeal from William S. Knudsen, its head, for "The swiftest possible production of the means of defense." There were strong indications in Washington of a tightening of Government control over industry and labor.

Extension of the system of priorities, spreading of defense work through sub-contracts to manufacturers not now engaged in such work, and extension of the work week are probable results.

By order of the President the scope of the priorities system has been extended to sub-contractors, which includes the steel and machine tool industries. The amended order gives the Priorities Board of the National Defense Advisory Commission control over "all orders" for defense whether direct or indirect. More rigid control over machine tools may immediately be exercised. Formal priorities on steel will come about more gradually, as the occasion demands, but in all probability will first be applied to British orders, which even now are being rushed by request. Some steel companies which have not hitherto supplied much steel to Britain have been asked to take larger quantities.

PRODUCTION of airplanes, ships, military tanks and other ordnance material will be greatly expanded if the President's "Lend-Lease" plan of aid for Britain is adopted. The first notable expansion, though not specifically covered in the President's plan, is in the shipbuilding for the British. The 60 ships which the Todd Shipyards Corp., New York, will build will take about 120,000 tons of steel, not including that needed for shipyards to be established at Portland, Me., and Richmond, Cal. At least 60 additional ships, possibly more, will eventually be contracted for.

Naval shipbuilding work has also been augmented by the placing of new contracts for 40 destroyers in excess of those previously contemplated and 33 additional naval vessels at a total cost of more than $500,000,000. The destroyers will take 25,000 tons of plain steel and the other ships about 150,000 tons. Additional cargo ships are also to be awarded by the Maritime Commission.

The large volume of shipbuilding work, together with other requirements, has brought about a serious delivery problem in wide plates, which are quoted from 20 weeks to the third quarter of next year, a situation indicating that this item may be one of the first to come under the influence of formal priorities.

STEEL companies will close December books with aggregate bookings at least equal to those of November and in some instances in excess, despite a slight easing in the pressure as the holiday period drew nearer. Because of the Christmas holiday, ingot production this week will be down to about 80 per cent, but probably will snap back next week to last week's rate of 97 per cent or thereabouts.

Having produced a record-breaking tonnage this year, the steel industry will enter 1941 with every prospect that this year's total will be considerably exceeded. Steel companies will start 1941 with the heaviest backlogs in their history. In addition to defense work, new prospects include a considerable additional volume of railroad equipment.

A sufficient number of sales of pig iron at the recent $1 a ton advance has been made to establish the market at the higher level. Producers of merchant iron who have not yet formally advanced their quotations have either withdrawn from the market or are taking only such business from regular customers as they are obliged to accept at "price in effect at time of shipment." Major producers are rationing pig iron to their regular customers on the basis of the amounts normally taken in the past. THE IRON AGE has advanced its quotations in principal producing districts, as a result of which the pig-iron composite price rises to $23.44, the first change since September, 1939, when there was a general advance of $2 a ton.

THE price stabilization division of the National Defense Advisory Commission has called a meeting of scrap dealers for Jan. 6 to discuss recent increases in iron and steel scrap prices. Other meetings will be held to canvass the price situation in pig iron and coke. Non-integrated steel makers are particularly affected by rising costs of these raw materials, since they have not advanced their prices for steel. Scrap markets are strong this week. No. 1 heavy melting steel is up 50c. at Cleveland and Youngstown and 25c. at Chicago. THE IRON AGE scrap composite, rising to $21.42, ends the year at its highest level of 1940.

The Industrial Pace . . .

HIGH LEVELS OF ACTIVITY in those heavy goods industries included in THE IRON AGE index of capital goods activity lifted the index moderately higher in the past week from 126.2 to 127.6. Gains in four of the components of the index were responsible for the advance. Steel ingot production, currently at near-capacity levels, advanced less than seasonally in the period.

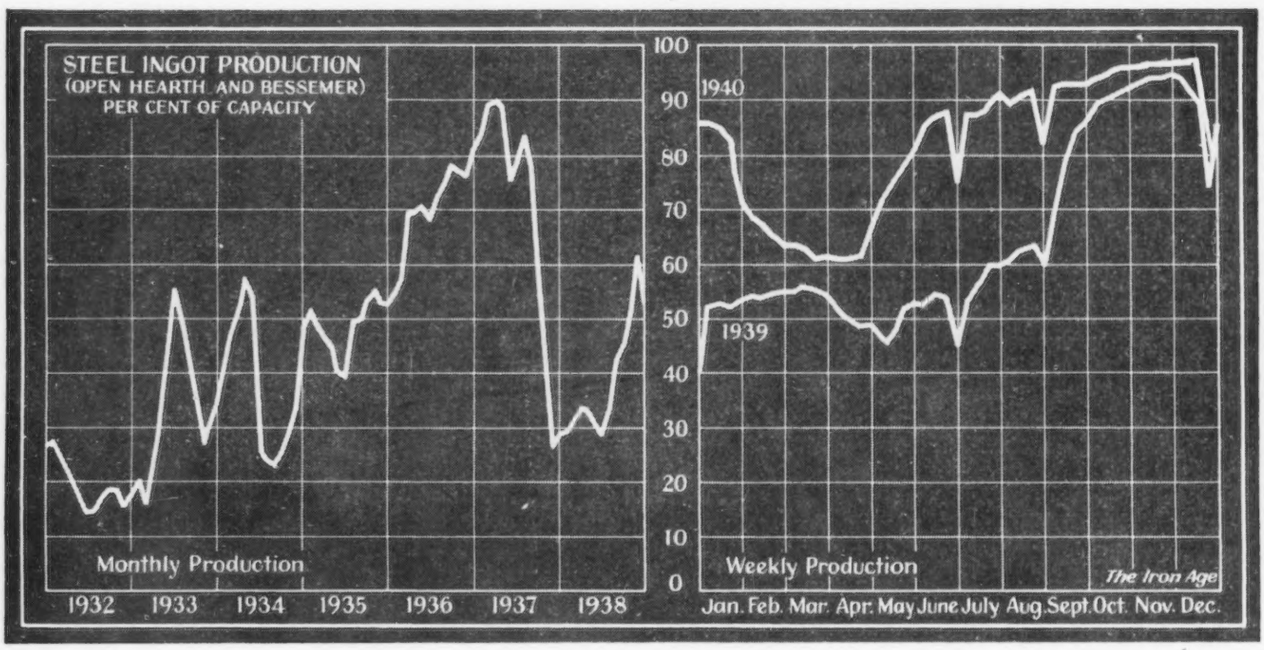
In line with expectations, automobile production continues at comparatively high levels, a more gradual decline than usual being in evidence. The component in the past week registered a gain of 2.8 points to 125.3, as compared with 122.5 in the previous week. Output was 125,370 units, down only slightly from the 125,626 cars produced in the preceding period. In the comparable week of 1939, when the component stood at 117.8, production totaled 117,705 cars.

The heavy engineering construction series registered its fourth consecutive weekly advance, moving upward to 159.9 from 157.0, and compared with 143.8 a month ago, and 81.8 in the corresponding week of 1939. New contracts totaled $131,135,000, as against $81,725,000 in the previous week. Increases in the volume of both public and private construction lifted the week's total. Privately-financed building went to $39,329,000 from $22,574,000, while public projects rose from $59,151,000 to $91,806,000. Larger awards included $12,000,000 for a housing development in New York, $10,000,000 for an aircraft factory in Missouri, $9,000,000 for anti-aircraft construction in North Carolina, and $9,000,000 for housing units in California.

TOTAL OF ENGINEERING CONSTRUCTION AWARDS in November (see graph), $382,724,000, was the highest for that month, and the third highest weekly average, on record. The weekly average for October, when awards totaled $702,842,000, was an all-time peak. The November weekly average is 32 per cent lower than that of October, but is 58 per cent higher than November, 1939. Private awards, although 45 per cent lower than October, are 14 per cent higher than November of last year. Public construction, largely as a result of the defense program, was 84½ per cent ahead of November, 1939, but 26 per cent under October.

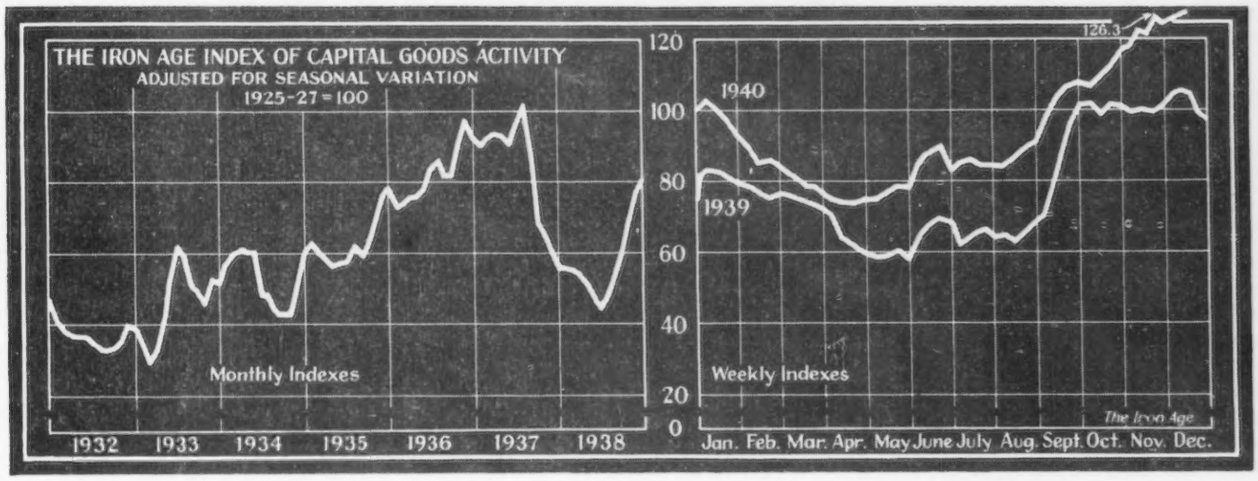
Prices of metals and metal products (see graph), as measured by the index of the Bureau of Labor Statistics, have shown only negligible increases, in spite of the high level of current industrial activity. Net result of fractional fluctuations during the four week period from Nov. 9 to Dec. 7 was a rise of 1/10 of a point in the index of 97.5.

Holiday Cuts Steel Rate to 80%



District Ingot Production, Per Cent of Capacity		Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	West-ern	St. Louis	East-ern	Aggre-gate
	Current Week . .	81.0	73.0	74.0	80.5	73.0	89.5	89.0	85.5	91.0	90.0	76.0	88.0	85.0	**80.0**
	Previous Week . .	96.0	97.5	95.0	94.0	92.0	106.0	104.0	94.0	106.0	100.5	89.0	102.5	115.0	**97.0**

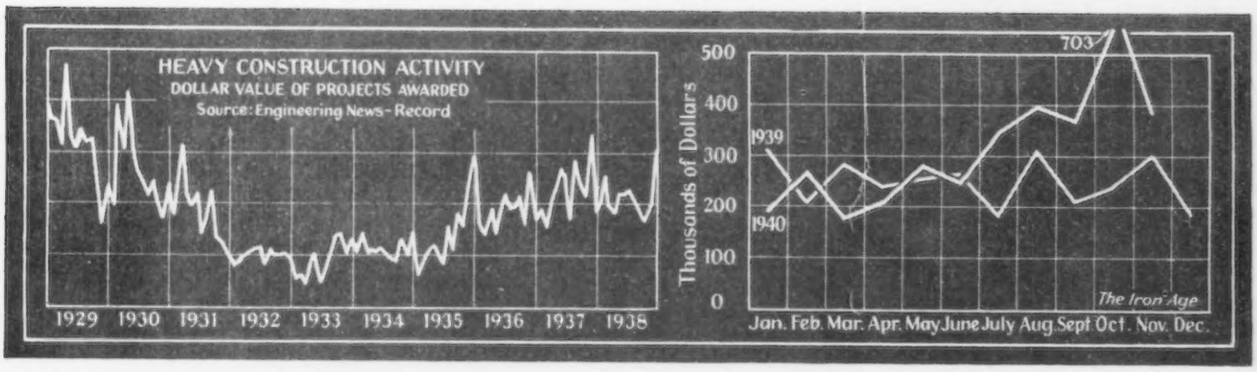
Capital Goods Index Extends Rise



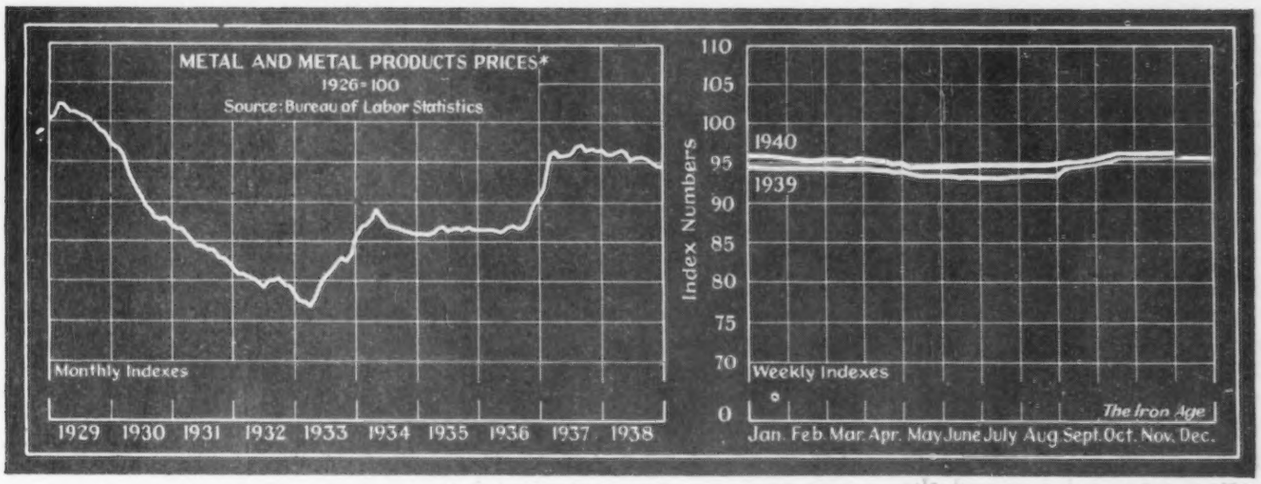
Component ▼ Week Ended ➤	Dec. 21	Dec. 14	Nov. 23	Dec. 23 1939	Dec. 21 1929
Steel ingot production[1]	138.2	139.5	145.7	130.7	93.9
Automobile production[2]	125.3	122.5	126.7	117.8	46.5
Construction contracts[3]	159.9	157.0	143.8	81.8	102.9
Forest products carloadings[4]	87.5	85.3	69.9	75.6	114.0
Pittsburgh output and shipments[5]	126.9	126.5	118.6	118.0	104.0
COMBINED INDEX	127.6	126.2	121.0	104.8	92.2

Sources: [1] THE IRON AGE; [2] Wards Automotive Reports; [3] *Engineering News-Record;* [4] Association of American Railroads; [5] University of Pittsburgh. Indexes of forest products carloadings and activity in Pittsburgh area reflect conditions as of week ended Dec. 14. Other indexes cover week of Dec. 21.

November Building Awards Off From October Peak



Metal Products Prices Change Little in November



* Based on 147 items, including iron and steel, non-ferrous metals and finished products as agricultural equipment, automobiles, tools, bolts, etc.

Market News

. . . THE WEEK'S ACTIVITIES IN IRON AND STEEL

New Business

. . . Orders equal to November's, in some cases ahead

Incoming business at PITTSBURGH so far this month has run well above both production and shipments. Some mills have gained about 10 per cent over the comparable period of November, while others are at least even with that period. Backlogs have expanded and further extensions have been made on some deliveries. Specifications from the British have been slow in coming through this month but that portion which has not been received will undoubtedly be made up in January.

At CLEVELAND the steel industry will enter 1941 with order backlogs at the highest peak in history despite an all-time record on December shipments. Production schedules are particularly heavy in electric furnace alloy steel, where delivery promises up to 36 weeks in the future are not uncommon, and in steel used for shell making and ship building.

Inventories at steel consuming plants are high, but generally appear to be in relation to increased operations and hence are not a source of worry.

New business at CLEVELAND from Dec. 2 to 23 was ahead of production by 20 to 30 per cent. Beginning last Friday a slight tapering began to appear in orders, representing a seasonal condition which will be less apparent this year than at any time in 20 years.

CLEVELAND reports that automotive die work which usually begins to get under way for the next year's models has not yet been inaugurated.

The seasonally expected decline has tapped CHICAGO mills lightly. Though the past week's record fell off anywhere from 10 to little more than 20 per cent at different mills, the month's business is pretty close to a par with the November total. The December discrepancy is not more than 5 to 10 per cent.

Two weeks before the year drew to a close, many of the agricultural implement manufacturers and also household appliance producers disclosed that 1940 would be a record-breaking year. Both of these industries have been substantial consumers of steel in that district for several months and they are continuing to be steady buyers. The implement builders are particularly busy since 1941 is expected to be the year of years for farm income. But these plants are also now contemplating greater defense acitivity and whether this will interfere with regular production remains to be seen. Railroad prospects for 1941 paint a rosy picture for considerable buying is in offing.

With CHICAGO mills getting well diversified business, the year's close found bars — carbon and alloy, structurals and semi-finished among the most active items. Backlogs are building up and deliveries are lengthening—the first third quarter promise for 1941 coming to light this week with one mill's announcement to this effect on sheared plates, 84 in. to 150 in.

The beginning of the usual slowing down in new inquiry at this season became apparent in the last few days of the past week in eastern Pennsylvania. So far in December, however, all producers are reporting orders easily up to November levels. One producer has completely reversed a downturn in new business noticed in the early part of the month. Delivery problems are assuming growing and paramount importance with most producers.

Shipbuilding

. . . Award of 60 ships to Todd Shipyards Corp. by British announced

The award of 60 steel ships, to take a total of about 120,000 tons of steel, to the Todd Shipyards Corp., New York, which is reported in detail in the news section of this issue, will bring about a large expansion of the shipbuilding industry, as entirely new yards for the assembly of these ships will be constructed, one at Richmond, Cal., and one at Portland, Me. Considerable steel will also be required for construction of the shipyards, though the amount is not yet known. Much of the work of constructing these ships will be done in structural and plate fabricating shops on a sub-contracting basis. The British ship program may be expanded to at least 120 ships, and possibly even more.

Calling for approximately 25,000 tons of plain steel, the Navy Department has announced awards for 40 destroyers in excess of those that had been contemplated. At the same time contracts for seven destroyers and two cruisers were cancelled and transferred to other yards. It was explained that this was done to facilitate and expedite construction in some cases and to have a similarity of design at the construction yards. The destroyer awards involved $253,384,875, while $8,300,000 additional was made available to private contractors to finance expansion of the shipbuilding facilities. With the destroyer awards the number of such naval units either afloat or projected is 365.

The awards to private yards follow:

Bethlehem Steel Co. (Shipbuilding Division), Quincy, Mass., four destroyers and $800,000 limiting cost of additional facilities; Staten Island, three destroyers and $700,000; San Francisco, seven destroyers and $1,500,000; San Pedro, six destroyers, and $1,250,000.

Bath Iron Works, Bath, Me., six destroyers and $400,000 limiting cost of additional facilities.

Federal Shipbuilding and Drydock Co., Kearny, N. J., six destroyers and $2,250,000 limiting cost of additional facilities.

Seattle-Tacoma Shipbuilding Co., Seattle, five destroyers and $1,400,000 limiting cost of additional facilities.

New York Shipbuilding Co., Camden, N. J., two cruisers.

Government Navy Yard allocations were as follows:

Boston, four destroyers; Philadelphia, two destroyers; Norfolk, two destroyers, and Charleston, S. C., two destroyers.

The following contracts were cancelled:

Bethlehem Steel Co. (Shipbuilding Division, Staten Island), three destroyers; San Francisco, two destroyers; San Pedro two destroyers.

Federal Shipbuilding and Drydock Co., Kearny, N. J., two cruisers.

Awards to private yards for the construction of 33 additional naval vessels, estimated to cost $265,765,500 and contracts totaling $6,600,000 for expansion of shipyard facilities have been announced by Secretary Knox. The ships will require about 150,000 tons of steel and will be built on a cost-plus-fixed-fee basis. Awards were distributed as follows:

Williamette Iron & Steel Corp., Portland, Ore., two mine layers, $1,000,000 for expansion of facilities.

Lake Washington Shipyards, Seattle, six small seaplane tenders.

Associated shipbuilders, Seattle, four small seaplane tenders, $700,000 for expansion.

Ingalls Shipbuilding Co., Pascagoula, Miss., four net layers, $2,000,000 for expansion.

Moore Dry Dock Co., Oakland, Cal., two submarine tenders and five submarine rescue vessels.

Sun Shipbuilding Co., Chester, Pa., three destroyer tenders and three seaplane tenders, $2,500,000 for expansion.

The Maritime Commission has invited bids on two groups of C-2 cargo ships, which will require a total of 3600 tons of steel each. Bids on the first groups, to be opened Jan. 6, have been asked on the basis of from one to six ships either Diesel or steam-propelled. Officials said that the number of vessels to be ordered will depend upon the prices quoted. The second group of bids to be opened Jan. 13, has been invited on a basis of one to four Diesel-propelled ships.

Consolidated Steel Corp., Los Angeles, was the apparent low bidder on Monday when the Maritime Commission opened bids for the construction of two marine transports. It bid $4,575,000 on a fixed price basis and $4,375,000 on an adjusted price basis.

Pusey & Jones Corp., Wilmington, Del., bid $7,268,540 on an adjusted price basis.

Steel Operations

. . . Holiday causes a drop to 80 per cent for this week

Because of the Christmas holiday, steel ingot production for the calendar week has slumped to 80 per cent of capacity, but from all indications the rate will go right back up next week to approximately last week's figure of 97 per cent. New Year's Day is not a steel mill holiday, so next week's operations will be affected little, if any.

Iron Ore

. . . Consumption of Lake ore 5,973,007 tons in November

Furnaces using Lake Superior iron ore consumed 5,973,007 gross tons in November compared with 6,051,347 tons in October, 1940, and 5,477,969 tons in November, 1939, according to the latest report of the Lake Superior Iron Ore Association, Cleveland.

November daily average consumption was higher than the daily average of October, and three more furnaces using Lake ore were in blast, but there were two fewer working days.

From Jan. 1 to Dec. 1 Lake Superior iron ore consumption totaled 56,253,276 gross tons, against 38,822,915 tons in the corresponding part of 1939.

Ore on hand at furnaces and Lake Erie docks Dec. 1 totaled 41,711,704 tons against 41,125,450 tons a month earlier and 40,732,096 tons on Dec. 1, 1939. The association reports 166 furnaces active on Nov. 30 out of a possible 189 dependent principally on Lake Superior ore.

Pig Iron

. . . Prices are generally $1 a ton higher on open market sales

The pig iron market presents an odd situation in that very few producers have formally announced price advances, yet any iron that is being sold in the open market is quoted at $1 a ton above the prices that were recently in effect, with the exception that some producers are taking orders, when obliged to do so, at "price in effect at time of shipment."

Some of the major producers, including the steel companies, are quoting no prices at all. They are, virtually without exception, allocating iron to their regular customers on a rationing basis and are turning down any orders that appear to be much in excess of the amounts that such customers have normally taken in the past. Probably reasonable allowance would be made for increased melt at some foundries, but efforts by melters to obtain further protection when they already have unshipped orders on producers' books are quite generally unsuccessful.

In view of the fact that any iron that is available for reasonably prompt delivery easily commands an advance of $1 a ton over recent prices, THE IRON AGE recognizes the situation in its quotations this week, applying the increase to all districts except the South and the Pacific Coast, where the situation is still not clear as to what may be done. THE IRON AGE pig iron composite price is advanced to $23.44, the first change since September, 1939, when there was a general advance of $2 a ton.

Cleveland reports that sales for first quarter shipment at the new price have been extensive over a wide section of the country, including New England, New York, western Pennsylvania, Ohio, Illinois, Indiana and Michigan. However, a good deal of tonnage that was booked before the advance will be carried over 1941 as delivery cannot be completed this month.

Reports from Pittsburgh, Philadelphia, Chicago and St. Louis all state that pig iron has been sold in those areas at the $1-a-ton advance.

Semi-Finished Steel

. . . Heavier domestic and British orders received

Heavier domestic requirements and receipt of specifications from the British have swelled semi-finished order books this past week at PITTSBURGH. It is expected that any slowdown because of the Christmas holiday will be short.

CHICAGO manufacturers with large defense contracts are taking considerable tonnages of semi-finished steel. One of these turned in an order this week for 7000 tons. Forgers have been active buyers also. A slightly increasing percen-

tage of semi-finished steel produced in that district is going for foreign consumption.

Reinforcing Steel

. . . Awards total 16,600 tons; inquiries 2880 tons

Reinforcing steel awards advanced to 16,600 tons from 6110 tons last week. Lettings include 8000 tons at Union Center, Ind., for a government ammunition loading plant; 2000 tons for shipways for the New York Shipbuilding Corp., Camden, N. J.; 2000 tons at Robertson, Mo., for the Curtiss-Wright airplane plant; 1600 tons at Lockland, Ohio, for offices and a machine shop for the Wright Aeronautical Corp., and 1100 tons for warehouses for the quartermaster depot, Philadelphia.

New reinforcing steel projects of 2880 tons include no inquiries of more than 600 tons.

Railroad Buying

. . . Large volume of freight cars placed and pending

The year ends with large orders which will keep car and locomotive builders busy for some time to come.

The Elgin, Joliet & Eastern has ordered 1250 freight cars, distributed as follows: 250 70-ton hopper cars to Ralston Steel Car Co.; 200 box and 150 gondola cars to Mount Vernon Car Co.; 300 box cars to American Car & Foundry Co., and 350 50-ton gondolas to General American Transportation Corp.

The Duluth, Teon range has purchased 100 50-ton gondolas from American Car & Foundry Co. Pressed Steel Car Co. has been awarded an order of 1000 box cars for the Pittsburgh & Lake Erie Railroad.

Missouri Pacific has been authorized by the federal court at St. Louis to purchase the following equipment: 1200 50-ton hopper coal cars, 100 50-ton box cars, 70 hoppers and some locomotives.

The Union Pacific has placed on order with company shops for 2000 50-ton box cars.

The Russian government bought 100 steel air-dump cars from Pressed Steel Car Co. Utah Copper Co. is taking a similar number of 100-ton steel ore cars in addition to 15 air dump cars from the same company.

Divided evenly between American Car & Foundry and General American Transportation is an order of 100 50-ton steel hopper cars for the Litchfield & Madison.

Among outstanding inquiries are: 1000 gondolas for the South African railways, 300 flat and 50 mill-type gondolas for Union Pacific, 1000 gondolas, 200 ore and 500 box cars for Chicago & North Western.

Locomotive orders consist mainly of diesel switching purchases. Of this type Missouri Pacific has been authorized to Buy 11. Electro-Motive Corp. has received orders for 10 diesel switchers from Union Pacific, three from Central of Georgia and three others. General Electric is making two 300-hp. diesel-electric switchers for Canadian Car & Munitions, Ltd. Baldwin Locomotive Works has received orders for four similar units and five freight locomotives, one of which for Sao Paula-Parana Railroad of Brazil and four for the United Fruit Co.

A rail order of 5000 tons was placed by the Erie with Carnegie-Illinois Steel Corp.

Class I roads put 59,473 new freight cars into service in the first 11 months of 1940 and in the same period last year only 20,085, the Association of American Railroads reports. For locomotives, the comparative figures are: 367 in 1940, 104 of which were steam engines and 263 diesel and electric, and 310 in 1939. In about the same proportion for steam and diesel.

Wire Products

. . . Defense requirements adding heavily to bookings

With total wire tonnage placed so far this month well ahead of the corresponding November period, PITTSBURGH wire mills look for no abatement in the volume of incoming business during the rest of this month. Holiday interruptions are expected to be kept at a minimum, both as to sales and production.

Requirements of the government defense program are increasing week by week, according to CLEVELAND producers, who have been receiving generous tonnages of rope and cable, all types of manufacturers' wires, rods, nails and kindred items. Orders from Dec. 2 to 21 were comparable with the average of October and November. Production and shipments continue above normal. Spots exist for acceptance of additional business for first quarter delivery here and there on producers' schedules.

Merchant Bars

. . . Orders being placed in record-breaking volume

Probably all records for placement of bar business at PITTSBURGH have been broken within the past two weeks and business so far this month is running moderately ahead of the same period a month ago. Backlogs have increased and deliveries are further extended.

No sign of a letup in buying has appeared yet at CLEVELAND or YOUNGSTOWN where orders from Dec. 2 to 21 are 20 to 30 per cent of the comparable part of November. While requirements of the British have played a prominent part recently, a gain would have been shown even without this class of business. Shell steel orders, of course, call for shipment over an extended period, but much recent business has been for delivery as promptly as possible, which in the majority of cases cannot be offered until very late in first quarter. Indications at CLEVELAND and YOUNGSTOWN are that production and shipments will hit a new peak this month.

Both carbon and alloy bars have led the CHICAGO list of popular items for some months and the year's close finds them still at the top. Defense program requirements, record-breaking activity among farm implement sellers, and a broad general demand from most consumers have been responsible. One of the past week's principal orders for one mill was around 2800 tons from a screw and bolt manufacturer. Backlogs are heavy at all steel plants there and deliveries are generally not promised in less than two months.

The Bureau of Supplies and Accounts will open bids on Jan. 3 for 594 tons of cold nickel steel bars for aircraft carriers under construction at the Boston Navy Yard.

Structural Steel

. . . Fabricated awards 34,800 tons; inquiries 21,100 tons

Fabricated structural steel awards of 34,100 tons are slightly lower than a week ago. The largest lettings include 8500 tons of bearing piles for the Consolidated Aircraft Corp. at San Diego, Cal.; 4200 tons in Brooklyn for a section of the elevated parkway; 3500 tons for the Statler Hotel, Washington; 3500 tons for a Navy assembly shop at Hunters Point, San Francisco; 2600 tons at Morgantown, W. Va., for E. I. du Pont de Nemours & Co.; 2500 tons for an airplane repair shop at Hill Field, Ogden, Utah; 1800 tons for 25 Army warehouses at Kingsbury, Ind., and 1300 tons for the Lima Locomotive Works, Lima, Ohio.

Structural steel projects declined to 21,100 tons from 30,550 tons last week. New inquiries of size are 5700 tons for a munition magazine at La Porte, Ind.; 4500 tons for an assembly shop for the Navy at Louisville, Ky.; 1700 tons at Jeffersonville, Ind., for two warehouses for the Quartermaster Depot, and 1125 tons for a bascule bridge at Portland, Me.

Sheets and Strip

. . . Business has gained this month over November

With miscellaneous sources specifying freely, automobile companies continuing to book representative tonnages steady, and with household appliance manufacturers specifying heavily, aggregate sheet bookings at PITTSBURGH the past week were in excess of those received in the week before. Some sources look for a leveling off in demand from the automobile industry, but the decline will probably take place slowly. The holidays are expected to affect the flow of specifications only to the extent of actual time taken off by sales and production departments.

At CLEVELAND and YOUNGSTOWN new business for the first 20 days of December showed a marked gain over the corresponding part of November, and some sellers believed that buying was actually gaining momentum. Faced with the extended delivery situation, consumers are specifying farther ahead than ever. The situation at present is such that any slackening in one particular item, say cold rolled sheets, would hardly affect total sales appreciably. The space on mill schedules available for tonnage for first quarter delivery is very limited.

Record-breaking activity by manufacturers of refrigerators, washing machines and other household appliance builders has made sheet business for all CHICAGO mills very strong. One order for 3000 tons was received this week from a Mid-Western manufacturer. Deliveries have been extended slightly on strip mill sizes, and on strip, 2½ in. and under.

Sheet steel business continues active at a rate of about 150 per cent of mill capacity in the SOUTHERN OHIO district. All sheet users are in the market with very little variation from week to week. Galvanized demand continues to adhere to an unseasonable high level and is causing some concern on the question of deliveries.

Tubular Goods

. . . Standard pipe sales expand materially

Paced by national defense requirements, standard pipe sales at PITTSBURGH have expanded substantially in the past week or two. The influx of this type of business has also stimulated miscellaneous merchant pipe demand with the result that orders for merchant pipe so far this month are running somewhat ahead of a month ago. Oil country goods demand has changed but little. However, specifications for mechanical and boiler tubing continue in heavy volume.

December merchant pipe orders at CLEVELAND and YOUNGSTOWN appear likely to become heaviest of any month this year. Jobbers are moving material freely out of stocks, and there is every indication that purchases with a speculative tonnage are quickly found to be necessary for immediate use. A slackening in demand over the holidays would not be surprising to some sellers, but production will continue high because of order backlogs. The pipe line market is described as consisting of numerous small-lot purchases, but lacking big orders.

Plates

. . . Deliveries lengthen, business is being turned down

Comparison of sales figures on plates at PITTSBURGH are of little value since some steel makers are being forced to turn down business owing to the booked-up position of the mills. Deliveries continue to be quite extended, backlogs are heavy, and yet no important instance of consumers having to shut down operations because of lack of steel has become apparent. High-speed continuous mills are breaking records daily on plate production.

The announcement of third quarter deliveries in 1941 on sheared plates, 84 in. to 150 in., was made this week by a leading CHICAGO producer. Deliveries have lengthened slightly on 30 to 84 in. sheared plates at the same mill. With railroad buying activity at a very high level, supported by general demand from widely diversified sources, all producers there find themselves with a considerable plate backlog.

New ship construction, scheduled for 1941, will require additional tonnages of plates in the PHILADELPHIA area. As a result of continued piling up of fresh orders at all mills in the district, delivery promises are extended further into the future. Shipments are now running from six weeks to early April.

Tin Plate

. . . Holiday shutdowns reduce operations this week

Because of holiday shutdowns, tin plate operations this week are off some from a week ago, but next week the rate is expected to approximate 47 per cent with cold reduction mills to operate between 70 and 75 per cent. Little or no change has been apparent in the volume of incoming business.

Plans Studied for Can Plant Expansion

Toledo, Ohio

• • • **Plans for a** $350,000 addition to the Clearing, Ill., plant of the Owens-Illinois Can Co. are being developed by Hughes-Foulkrod Co., Philadelphia, engineers. The structure will be three stories high, 160 x 320 ft. with insulux glass blocks side walls and roof insulated with fiberglas.

Machine Tools

. . . SALES, INQUIRIES AND MARKET NEWS

Large Volume Orders Seen

Cleveland

• • • **Large volume purchases** are on the horizon again. Besides masses of orders to be needed for new plants and enlargements which the Government is spurring, at least $50,000,000 in machine tools will be required for the British program, according to an estimate believed reliable.

The industry, already expanded manyfold and producing at a remarkable rate despite its inability to obtain a clear view ahead, will spread out farther and adopt every conceivable means to meet the ever increasing load. However, the principal obstacles are becoming more formidable, including mounting costs, constantly lengthening deliveries on certain parts and raw materials, exhaustion of the cream of the subcontracting shops, dwindling supplies of suitable trainees and the generally unbalanced and indigestible load of orders.

A foundry company at Youngstown is engaged in producing a new line of shell lathes in cooperation with a Pittsburgh machinery dealer.

No Letup in Demand

Cincinnati

• • • **Approach of the holiday** period has brought no letup in the steady demand for machine tools in this area. Manufacturers report that they are sold out for approximately a year in advance, with business continuing to pile up on order books. The general impression among the machine tool builders is that they are going to try to comply with Mr. Knudsen's recent request for a speed-up in the industry and opinions are that this will be accomplished by an increase up to as high in some instances as 40 per cent over 1940, which was approximately twice as productive a year as the year preceding.

With the approach of employment programs for the Wright Aeronautical Corp. in the Cincinnati area, plant executives find the labor question presenting a new and serious problem. The Wright company anticipates employing some 15,000 men, which is about 2000 more than the estimated total number employed by the machine tool industry of Cincinnati. The feeling is that men on the night shift are likely to be attracted to day jobs at the Wright plant, with a possibility that more attractive wages may be offered by the Wright company. No solution of the problem has yet been forthcoming, although Wright officials and machine tool men have conducted a number of conferences, seeking to solve the problem of a possible shift in labor from the machine tool plants.

Machine Tool Builders Are Buying Many Tools

Chicago

Manufacturers of machine tools are among their own biggest customers. With machine tool plant expansion now an ordinary occurrence, a heavy and tremendously urgent demand for each other's product now comes from within the industry itself. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., for instance, has already ordered around $900,000 of new equipment for its plant addition. Orders for an even larger amount have been placed by an expanding Chicago manufacturer, who has government aid. Among those outside the industry who are trying to squeeze new buying programs on the books are Electro-Motive Corp., La Grange, Ill., which has been buying steadily for an addition recently completed, and which is reported to be considering another space increase; J. I. Case Co., which has important shell contracts; the Mall Tool Co., Chicago, which is reported to be spending around $100,000; the new Curtiss-Wright project at St. Louis, and many others.

Typical of the way manufacturers are using sub-contractors to speed up output is the milling machine producer in this section who has over 75 different firms making parts. Another builder is reported to be taking the entire output of more than six foundries. It is felt that even greater use will have to be made of the farming out process if production is to be stepped up as demanded. The trouble is, of course, that reliable secondary sources are difficult to find. The good ones have more business than they can handle and when they, too, try to expand facilities, they run up against the priority situation which is still very much involved.

Crescent Tool & Die Co. Will Expand Again

Chicago

• • • **Two weeks after** completion of a 6500-sq. ft. addition, the Crescent Tool & Die Co., here, started plans for further expansion. The new expansion will provide 3000 sq. ft. of manufacturing space and will be completed in April. About $15,000 is to be spent for new tool room and stamping equipment.

New Plane Engine Makers Reported

South Bend, Ind.

• • • **Reports are current** here that both Studebaker Corp., located here, and the Buick division of General Motors are to receive sizable orders from the government for the building of air-cooled airplane engines. According to the rumors, Studebaker will operate under a license from Wright Aeronautical Corp. and Buick under license from Pratt & Whitney.

Wright Aeronautical Licensed by Bullard

• • • **The article** "Plating and Painting of Aircraft Cylinders," by H. E. Linsley, of Wright Aeronautical Corp., in the Dec. 12 issue of THE IRON AGE, described in part the cleaning of parts by the Bullard-Dunn process. It should have been pointed out that this process is fully patented and licensed by the Bullard Co., Bridgeport, Conn.

Non-Ferrous Metals

. . . MARKET ACTIVITIES AND PRICE TRENDS

NEW YORK, Nov. 23—The purchase of 100,000 tons of South American copper to augment domestic production during the coming year was announced in the past week by the Metal Reserves Co., government agency. About 72,000 tons was purchased conditionally on the basis of 10c. a lb., f.a.s., New York, while the remainder was obtained at 9.50c. f.a.s., Chilean ports. Deliveries will begin not later than March and are expected to be made at the rate of about 15,000 tons a month. By and large, all major non-ferrous markets in the past week were substantially unchanged from the previous period. Lead demand was in corresponding volume, while sales of tin were a trifle lighter. Allocation routines in copper and zinc were continued.

Sales of electrolytic copper were in good volume during the week with all major producers adhering to the price of 12c. a lb., delivered Valley. Most of the activity involved the March position. Inquiry in the custom smelter market was comparatively light at 12.50c. for first-quarter shipment, and 12.375 for second quarter. The export market saw some activity during the week on the basis of 10.25 to 10.50c. a lb., f.a.s.

Lead

Not including 9000 tons of foreign refined lead which entered the domestic market during the month, lead shipments in November totaled 57,510 tons, a decline of about 8 per cent from the October figure of 62,496 tons, statistics appearing in the week showed. Of approximately 67,000 tons shipped to customers in November, about 14 per cent was composed of foreign refined metal. October shipments totaled about 62,000 tons. Production in November showed an increase over the October figure, being 57,926 tons, as compared with 56,600 tons. The market in the past week was moderately active and sales volume was at about the same level as the previous week. Producers were in most cases able to dispose of intake, although some available metal was not taken up. Buying was mainly for January, which is now somewhere in the neighborhood of 50 per cent sold. December metal has not yet been entirely disposed of, some sellers reporting carload sales in the week.

Zinc

Although the actual instituting of priorities has not yet taken place and it cannot be determined as to just when it will, further progress has been reported in the setting up of an organization to handle the supply problem if and when it is deemed to become necessary. Currently, the market situation is unchanged with all sellers at the established 7.64c. a lb., delivered New York, price level. All producers continue their well-defined policy of dividing supplies so as to give precedence to the most urgent requirements. An indicated willingness on the part of buyers to pay premiums has brought forth no positive reaction due to physically straight supplies. Sales in the past week were in good volume, almost all of the material going for delivery beyond March.

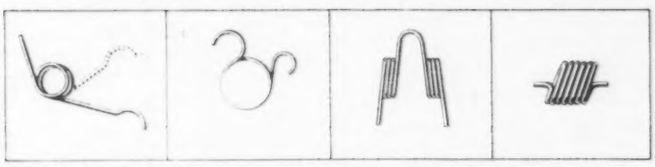
Tin

Most prominent feature in the market in the past week was the purchase of 365 tons by the Navy Department for delivery within two months, in which several factors participated. At 50.05c. a lb., delivered New York on Tuesday, the price of prompt Straits metal strengthened somewhat, moving up to 50.10c. on Wednesday and holding to that level through the remainder of the week.

(Nonferrous prices on page 97)

the practical side of Springmaking — BY DUNBAR

Some tips on TORSION SPRINGS



* They should be free on rod or post—when under full load.
* The action should tend to reduce or wind the coils.
* Sharp bends should be eliminated.
* Material should be selected for individual conditions of temperature, corrosion or stress.
* Ends should be designed for easy assembly.

WE RECOMMEND

that you send us your assembly. We may be able to anchor one arm to it—or change the contour to save on assembly time.

Dunbar Bros. Co.

DIVISION OF ASSOCIATED SPRING CORPORATION

BRISTOL, CONNECTICUT

"Quality Springs Since 1845"

Scrap . . . MARKET ACTIVITIES AND QUOTATION TRENDS

As the result of a meeting in Washington last week of purchasing officers of leading steel mills in the office of Leon Henderson, head of the Price Stabilization Division of the National Defense Advisory Commission, a meeting of representatives of the Institute of Scrap Iron and Steel and the Waste Material Dealers Association has been called by Mr. Henderson for Jan. 6 to discuss recent price advances on iron and steel scrap.

Some of the non-integrated steel companies, which must buy both scrap and pig iron, are particularly affected by rising costs of these commodities, since they cannot obtain higher prices for steel so long as their larger competitors do not advance their prices.

Meanwhile, scrap markets are strong this week even where no actual price advances have gone into effect. There was spirited bidding for automotive scrap lists at Detroit, where local suppliers vied with brokers representing mills in other districts for the scrap that was offered. A Pittsburgh scrap broker has had a representative on a scouting trip through New England to buy up "hidden" scrap. These are indications of the tighter supply situation, even though many in the scrap trade insist that there is no real danger of a shortage. Cast scrap is especially strong in line with higher pig iron prices. Steel scrap has gone up 50c. at Cleveland and Youngstown, and 25c. at Chicago. THE IRON AGE scrap composite price, advancing to $21.42, is at its highest point of 1940 as the year comes to an end.

Pittsburgh

A strong undertone continues. Brokers are still experiencing difficulties in obtaining scrap at present quotations. Some orders continue to be filled in part at least by yard supplies. Secondary grades are strong also. No. 1 heavy melting steel remains quotable this week at $22.50 to $23 a ton. Within the past few days, supplies have become exceptionally tight and some brokers are paying as much as $23 a ton for No. 1 steel.

Philadelphia

The cast market was stronger in the past week as supplies became increasingly difficult to obtain. On the basis of sales made in the period, No. 1 cupola moved up 50c. to $23.50 to $24. Sales of prime steel making grades into consumption continued on the basis of quoted prices.

Chicago

The ceiling of $20.75 which has covered No. 1 heavy melting steel for several weeks has been lifted, with quotations now raised to $20.50 to $21 on the basis of mill purchases. The entire list is strong but trading is regular and orderly. No fear of a shortage of material is expressed anywhere.

Youngstown

On the basis of actualities here during the past week No. 1 heavy melting steel is quoted up 50c. a ton to a range of $23.50 to $24. The customary seasonal lull had not made its appearance up to Monday, and scrap was being received at mills with open arms.

Cleveland

This year all the rules of the past are out the window in scrap as in other commodities. For instance, continued strong demand has featured the market here right up until Monday, and a 50c. rise in published heavy melting $22.50 to $23 a ton.

Buffalo

The Buffalo scrap market has attained an exceptionally strong tone with a sale into consumption of about 5000 tons of No. 1 heavy melting steel reported in the range of $22 to $22.50. Brokers report pressure from Washington relative to any new price advances. Specialties and steel rails under 3 ft. are up 50c. this week on the basis of several small sales. Dealers are busy filling old orders.

St. Louis

The scrap market in St. Louis was active only as far as buying by dealers was concerned, the mills preferring to wait until after inventory adjustments at the close of the year. Offerings from the country were freer toward the end of the week. Prices were unchanged.

Cincinnati

Old materials continue to rule strong in this area and only the desire of the trade generally to stabilize prices is keeping bids at present levels. Mills are taking virtually all scrap offered and the foundry interests continue to buy cast grades at a good rate.

Birmingham

The market continues strong here with all grades remaining firm and steady. While flow of scrap into the district is still showing a slight increase in volume, heavy demand reflected in capacity operations of mills and foundries is preventing any accumulation.

Detroit

Automotive lists closing within the last week have revealed an extremely bullish sentiment that appears to be based partly upon speculation and partly on a scramble for scrap by out-of-town buyers and consumers. A large part of the material sold in the last week is destined for shipment outside Detroit, with all grades of scrap being involved, even those which normally are consumed locally in foundries, etc. This strong sentiment is accompanied by resumption of 100 per cent operations in the open hearths in this area with promise that they will all be continued in service except for repairs.

New York

The scrap market continues very strong and mills demand more and more material, while dealers are having increasing difficulty in drawing it into the market. This is reflected in an advance of 50c. for both No. 1 and No. 2 heavy melting scrap, the first advance in these grades for some time. Specialties, however, have advanced noticeably in the past few weeks. On Dec. 17 the contract for wrecking the Second Avenue elevated was bid in at $40,100 by Associated Metals & Minerals Corp., New York. The demolition of the Ninth Avenue "El" is proceeding rapidly.

Boston

Trade is active and excited and prices generally higher. Certain brokers, short of the market, are paying prices above the general market. One broker paid $11.50 a ton f.o.b. for borings suitable for steel mill use, as against an average market price of not more than $11. A Pittsburgh broker personally scouting around New England for scrap, an unusual incident, offered Providence, R. I., interests $15.25 a ton f.o.b for No. 2 steel, as against $14.75 to $15, the average price range. The American Steel & Wire Co., Worcester, Mass., is reported as in the market for Nos. 1 and 2 steel, but Boston district brokers are more interested in covering that company's old orders than selling more steel.

Toronto

Action became more general in the scrap markets during the week. Roads have been opened and shipments are in heavy volume from many sections of the province. In addition large tonnages are coming in from as far west as Winnipeg. A new freight rate for scrap materials such as heavy cast, rail and structural shapes loaded on 50-ton cars has been put into effect amounting to $8.80 per ton from this point, approximately half the former rate.

IRON AND STEEL SCRAP PRICES

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$22.50 to $23.00
Railroad heavy mltng.	23.50 to 24.00
No. 2 heavy melting...	21.00 to 21.50
Railroad scrap rails..	24.00 to 24.50
Rails 2 ft. and under..	27.00 to 27.50
Comp. sheet steel.....	22.50 to 23.00
Hand bundled sheets.	21.00 to 21.50
Heavy steel axle turn.	21.00 to 21.50
Heavy steel forge turn.	20.00 to 20.50
Machine shop turnings	16.00 to 16.50
Short Shov. Turn. Alloy Free	17.00 to 17.50
Mixed bor. & turn....	15.50 to 16.00
Cast iron borings.....	16.50 to 17.00
Cast iron carwheels...	23.00 to 23.50
Heavy breakable cast.	18.00 to 18.50
No. 1 cupola cast.....	22.50 to 23.00
RR. knuckles & coup.	27.00 to 27.50
Rail coil springs.....	27.50 to 28.00
Rail leaf springs	27.50 to 28.00
Rolled steel wheels...	27.50 to 28.00
Low phos. billet crops.	27.50 to 28.00
Low phos. punchings.	27.50 to 28.00
Low phos. heavy plate.	25.50 to 26.50
Railroad malleable ...	26.50 to 27.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$20.50 to $21.00
No. 2 hvy. mltng. steel.	19.50 to 20.00
Hydraulic bund., new.	20.50 to 21.00
Hydraulic bund., old..	17.50 to 18.00
Steel rails for rolling.	25.00 to 26.00
Cast iron carwheels..	23.00 to 23.50
Hvy. breakable cast..	21.50 to 22.00
No. 1 cupola cast.....	23.50 to 24.00
Mixed yard (f'd'y) cast	20.00 to 20.50
Stove plate (steel wks.)	18.50 to 19.00
Railroad malleable	22.50 to 23.00
Machine shop turn....	15.00 to 15.50
No. 1 blast furnace..	.... 14.00
Cast borings	15.00 to 15.50
Heavy axle turnings..	19.00 to 19.50
No. 1 low phos. hvy...	26.00 to 26.50
Couplers & knuckles..	25.50 to 26.00
Rolled steel wheels...	25.50 to 26.00
Steel axles	25.00 to 25.50
Shafting	25.50 to 26.00
Spec. iron & steel pipe	18.00 to 18.50
Cast borings (chem.).	.... 15.00

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton
Hvy. mltng. steel.....	$20.50 to $21.00
Auto. hvy. mltng. steel alloy free	19.50 to 20.00
No. 2 auto steel.....	17.00 to 17.50
Shoveling steel	20.25 to 20.75
Factory bundles	20.00 to 20.50
Dealers' bundles	18.50 to 19.00
No. 1 busheling	19.50 to 20.00
No. 2 busheling, old..	11.50 to 12.00
Rolled carwheels	24.25 to 24.75
Railroad tires, cut ...	24.00 to 24.50
Railroad leaf springs.	23.50 to 24.00
Steel coup. & knuckles	23.50 to 24.00
Axle turnings	19.75 to 20.25
Coil springs	25.50 to 26.00
Axle turn. (elec.).....	20.25 to 20.75
Los phos. punchings..	23.50 to 24.00
Low phos. plates 12 in. and under	24.00 to 24.50
Cast iron borings	14.25 to 14.75
Short shov. turn.....	14.75 to 15.25
Machiine shop turn...	14.75 to 15.25
Rerolling rails	24.50 to 25.00
Steel rails under 3 ft..	24.50 to 25.00
Steel rails under 2 ft..	25.00 to 25.50
Angle bars steel	23.50 to 24.00
Cast iron carwheels...	21.50 to 22.00
Railroad malleable	24.00 to 24.50
Agric. malleable	18.50 to 19.00
	Per Net Ton
Iron car axles	$24.50 to $25.00
Steel car axles	24.50 to 25.00
Locomotive tires	18.75 to 19.25
Pipes and flues	14.50 to 15.00
No. 1 machinery cast..	19.00 to 19.50
Clean auto. blocks ...	18.00 to 18.50
No. 1 railroad cast....	18.00 to 18.50
No. 1 agric. cast.....	16.50 to 17.00
Stove plate	13.50 to 14.00
Grate bars	14.50 to 15.00
Brake shoes	14.50 to 15.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$23.50 to $24.00
No. 2 hvy. mltng. steel.	22.00 to 22.50
Low phos. plate	26.50 to 27.00
No. 1 busheling	22.50 to 23.00
Hydraulic bundles ...	23.00 to 23.50
Machine shop turn...	15.00 to 15.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$22.50 to $23.00
No. 2 hvy. mltng. steel.	21.50 to 22.00
Comp. sheet steel.....	$27.00 to $27.50
Light bund. stampings	18.50 to 19.00
Drop forge flashings..	21.00 to 21.50
Machine shop turn....	14.50 to 15.00
Short shov. turn.....	15.00 to 15.50
No. 1 busheling	21.75 to 22.25
Steel axle turnings...	21.50 to 22.00
Low phos. billet and bloom crops	27.00 to 27.50
Cast iron borings.....	15.50 to 16.00
Mixed bor. & turn....	15.50 to 16.00
No. 2 busheling	15.50 to 16.00
No. 1 Machinery cast..	23.50 to 24.00
Railroad cast	22.50 to 23.00
Railroad grate bars...	16.00 to 16.50
Stove plate	16.00 to 16.50
Rails under 3 ft.	27.00 to 28.00
Rails for rolling	25.50 to 26.00
Railroad malleable ...	25.00 to 25.50

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$22.00 to $22.50
No. 2 hvy. mltng steel.	20.00 to 20.50
Scrap rails	23.00 to 23.50
New hvy. b'ndled sheets	20.00 to 20.50
Old hydraul. bundles..	18.50 to 19.00
Drop forge flashings..	20.00 to 20.50
No. 1 busheling	20.00 to 20.50
Machine shop turn....	14.50 to 15.00
Shov. turnings	15.50 to 16.00
Mixed bor. & turn.....	14.50 to 15.00
Cast iron borings.....	14.50 to 15.00
Knuckles & couplers..	26.00 to 26.50
Coil & leaf springs...	26.00 to 26.50
Rolled steel wheels...	26.00 to 26.50
No. 1 machinery cast.	21.00 to 21.50
No. 1 cupola cast.....	19.50 to 20.50
Stove plate	17.50 to 18.00
Steel rails under 3 ft..	26.50 to 27.00
Cast iron carwheels...	19.00 to 20.00
Railroad malleable ...	24.50 to 25.00
Low phos. plate	27.00 to 28.00

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting.	$18.25 to $18.75
No. 1 hvy. melting...	18.25 to 18.75
No. 2 hvy. melting....	17.75 to 18.25
No. 1 locomotive tires.	21.00 to 21.50
Misc. stand. sec. rails	21.75 to 22.25
Railroad springs	23.25 to 23.75
Bundled sheets	14.00 to 14.50
Cast bor. & turn.....	11.00 to 11.50
Machine shop turn....	11.50 to 12.00
Heavy turnings	14.00 to 14.50
Rails for rerolling.....	23.50 to 24.00
Steel car axles	25.75 to 26.25
No. 1 RR. wrought....	15.50 to 16.00
No. 2 RR. wrought....	17.25 to 17.75
Steel rails under 3 ft..	24.25 to 24.75
Steel angle bars	22.50 to 23.00
Cast iron carwheels...	21.75 to 22.25
No. 1 machinery cast..	21.00 to 21.50
Railroad malleable ...	22.00 to 22.50
Breakable cast	18.50 to 19.00
Stove plate	15.00 to 15.50
Grate bars	14.00 to 14.50
Brake shoes	15.00 to 15.50

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel	$19.00 to $19.50
No. 2 hvy. mltng. steel.	17.00 to 17.50
Scrap rails for mltng..	24.25 to 24.75
Loose sheet clippings.	13.50 to 14.00
Hyd'lic bundled sheets.	17.50 to 18.00
Cast iron borings	10.25 to 10.75
Machine shop turn....	11.00 to 11.50
No. 1 busheling	15.00 to 15.50
No. 2 busheling	8.50 to 9.00
Rails for rolling	25.25 to 25.75
No. 1 locomotive tires.	21.00 to 21.50
Short rails	26.25 to 26.75
Cast iron carwheels..	19.75 to 20.25
No. 1 machinery cast..	22.50 to 23.00
No. 1 railroad cast....	21.00 to 21.50
Burnt cast	13.75 to 14.25
Stove plate	13.75 to 14.25
Agricul. malleable ...	18.50 to 19.00
Railroad malleable ...	21.50 to 22.00
Mixed hvy. cast.	19.25 to 19.75

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting steel	....	$19.00
No. 2 hvy. melting steel	....	18.00
No. 1 busheling	....	17.00
Scrap steel rails	....	19.00
Steel rails under 3 ft..	....	21.00
Rails for rolling	....	20.00
Long turnings	....	9.50
Cast iron borings	....	8.50
Stove plate	....	12.50
Steel axles	....	19.00
No. 1 RR. wrought....	....	17.00
No. 1 cast	....	19.00
No. 2 cast	....	14.00
Cast iron carwheels...	....	20.00
Steel carwheels	....	19.00

DETROIT

Dealers' buying prices per gross ton, f.o.b. cars:

No. 1 heavy melting..	$17.50 to $18.00
No. 2 heavy melting..	16.50 to 17.00
Borings and turnings.	12.50 to 13.00
Machine shop turnings	12.50 to 13.00
Long turnings	10.00 to 10.50
Short shov. turnings..	13.00 to 13.50
No. 1 cast	19.50 to 20.00
Automotive cast	19.50 to 20.00
Hvy. breakable cast..	16.00 to 16.50
Stove plate	12.00 to 12.50
Hydraul. comp. sheets	20.00 to 20.50
New busheling	17.50 to 18.00
Sheet clips	15.50 to 16.00
Flashings	17.50 to 18.00
Low phos. plate	20.50 to 21.00

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel.	$16.50 to $17.00
No. 2 hvy. mltng. steel.	15.50 to 16.00
Hvy. breakable cast...	18.00 to 18.50
No. 1 machinery cast.	18.50 to 19.00
No. 2 cast	16.50 to 17.00
Stove plate	14.50 to 15.00
Steel car axles	22.00 to 22.50
Shafting	20.00 to 20.50
No. 1 RR. wrought....	18.50 to 19.00
No. 1 wrought long...	18.00 to 18.50
Spec. iron & steel pipe	13.00 to 13.50
Rails for rolling.....	20.00 to 20.50
Clean steel turnings*..	10.00 to 10.50
Cast borings*	10.50 to 11.00
No. 1 blast furnace...	9.00 to 9.50
Cast borings (chem.)..	11.50 to 12.00
Unprepared yard scrap	9.50 to 10.00
Light iron	6.50 to 7.00
Per gross ton delivered local foundries:	
No. 1 machin. cast....	$20.00 to $21.00
No. 2 cast	17.50 to 18.00

* $1.50 less for truck loads.

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars:

Breakable cast	$16.00 to $16.50
Machine shop turn....	10.00 to 10.50
Mixed bor. & turn....	9.25 to 10.25
Bun. skeleton long....	14.00 to 14.50
Shafting	19.75 to 20.00
Stove plate	13.50 to 13.75
Cast bor. chemical....	10.00 to 10.50
Per gross ton delivered consumers' yards:	
Textile cast	$20.00 to $22.00
No. 1 machine cast....	20.00 to 21.00
Per gross ton delivered dealers' yards:	
No. 1 hvy. mltng. steel.....	$13.00
No. 2 steel	12.50

PACIFIC COAST

Per net ton delivered to consumer:

	San Fran.	Los Ang.	Seattle
No. 1 hvy. mltng. steel	$14.25	$13.25	$15.00
No. 2 hvy. mltng. steel		12.00	
Bundles		10.00	

CANADA

Dealers' buying prices at these yards, per gross ton:

	Toronto	Montreal
Low phos. steel.....	$13.00	$12.50
No. 1 hvy. mltng. steel.	11.25	10.75
No. 2 hvy. mltng. steel.	10.00	9.75
Mixed dealers steel...	8.75	8.25
Drop forge flashings...	9.75	9.25
New loose clippings...	8.75	8.25
Busheling	6.00	5.50
Scrap pipe	7.75	7.25
Steel turnings	7.50	7.00
Cast borings	7.50	7.00
Machinery cast	20.50	19.50
Dealers' cast	19.50	18.50
Stove plate	16.00	15.50

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered barges	
No. 1 hvy. mltng. steel.	$16.50
No. 2 hvy. mltng. steel.	15.50
No. 2 cast	$16.00 to 16.50
Stove plate	14.50 to 15.00
Boston on cars at Army Base or Mystic Wharf	
No. 1 hvy. mltng. steel.	$17.00 to $17.50
No. 2 hvy. mltng. steel.	15.50 to 16.00
Rail (scrap)	17.00 to 17.50
Philadelphia, delivered alongside boats, Port Richmond	
No. 1 hvy. mltng. steel.....	Nominal
No. 2 hvy. mltng. steel.....	Nominal

Construction Steel

. . .STRUCTURAL STEEL, REINFORCING BARS, PLATES, PILING, ETC.

Fabricated Steel

Structural steel lettings of 34,100 slightly lower than a week ago; new projects decline to 21,100 tons from 30,550 tons last week; plate awards call for 4000 tons.

AWARDS

NORTH ATLANTIC STATES

4200 Tons, Brooklyn, elevated parkway, contract B-16, to American Bridge Co., Pittsburgh.

3500 Tons, Washington, Statler Hotel, to American Bridge Co., Pittsburgh.

850 Tons, Brooklyn, contract No. 6, Atlantic Avenue improvement, for Long Island Railroad Co., to American Bridge Co., Pittsburgh.

710 Tons, New York, St. Helena Church in Bronx, to American Bridge Co., Pittsburgh.

550 Tons, Newark, N. J., Ballantine bottling plant, to H. R. Goeller Co., Hillside, N. J.

520 Tons, New York, alteration and addition to Roosevelt Hospital, to Harris Structural Steel Co., Plainfield, N. J.

370 Tons, Portsmouth, N. H., State bridge over Sagamore Creek, to American Bridge Co., Pittsburgh, through O. W. Miller, Ludlow, Mass., contractor.

350 Tons, Hillsboro, R. I., state hangar to Phoenix Bridge Co., Phoenixville, Pa.

300 Tons, Fort Mifflin, Pa., building, to Belmont Iron Works, Philadelphia.

273 Tons, Erie, Pa., extension to building No. 13 for General Electric Co., to Erie Steel Construction Co., Erie.

250 Tons, Baltimore, land plane hangar and shops for city, to American Bridge Co., Pittsburgh.

230 Tons, Frederick, Md., hangar, to Belmont Iron Works, Philadelphia.

230 Tons, Gloucester, N. J., building for Sherwin-Williams Paint Co., to Bethlehem Steel Co., Bethlehem, Pa.

165 Tons, Brooklyn, Kings County Hospital, power house extension, to Lehigh Structural Steel Co., Allentown, Pa.

150 Tons, Wellsboro, Pa., storage building for Corning Glass Co., to Bethlehem Steel Co., Bethlehem, Pa.

THE SOUTH

2600 Tons, Morgantown, Va., building for du Pont Co., to R. C. Mahon Co., Detroit.

610 Tons, Alloy, W. Va., Electro-Metallurgical Co. building, to Lackawanna Steel Construction Co., Lackawanna, N. Y.

CENTRAL STATES

1800 Tons, Kingsbury, Ind., 25 warehouses for Army, to Bethlehem Steel Co., Bethlehem, Pa.

1300 Tons, Lima, Ohio, building No. 1 for Lima Locomotive Works, to Bethlehem Steel Co., Bethlehem, Pa., through James Stewart Co.

400 Tons, Canton, Ohio, extension for Timken Roller Bearing Co., to American Bridge Co., Pittsburgh.

260 Tons, Dearborn, Mich., extension to cold finishing mill for Ford Motor Co., to American Bridge Co., Pittsburgh.

260 Tons, Cleveland, plant extension for White Motor Co., to Mooney Iron Works Co., Cleveland.

200 Tons, Proving Ground, Ill., U. S. Government highway bridge, to Clinton Bridge Works, Clinton, Iowa.

WESTERN STATES

8500 Tons, San Diego, Cal., bearing piles for Consolidated Aircraft Corp., to Columbia Steel Co., San Francisco.

3000 Tons, San Francisco, Navy assembly shop at Hunters Point (Specification 10,172), to Columbia Steel Co., San Francisco, through Barrett & Hilp, S. F., contractor.

2500 Tons, Ogden, Utah, airplane repair shop, Hill Field, for War Department, to American Bridge Co., Pittsburgh.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

1125 Tons, Portland, Me., bascule bridge.

900 Tons, Buffalo, arms manufacturing building for Fedders Mfg. Co., Inc.; bids in.

700 Tons, Hartford, Conn., South Meadow Station extension for Hartford Electric Light Co.

625 Tons, Maspeth, N. Y., building for Hamabe Realty Co.

600 Tons, Allentown, Pa., administration building for Central Catholic High School.

550 Tons, Niagara Falls, N. Y., CC-2 plant, project No. 6659, for Government.

525 Tons, Mechanicville, N. Y., Hudson River bridge for Rensselaer and Saratoga Counties.

510 Tons, Edgewood, Md., clothing impregnation plant for Government.

475 Tons, Chester, Pa., shipway crane runways for Sun Shipbuilding Co.

450 Tons, Niagara Falls, N. Y., plant addition for R. & H. Chemical Co. (division of du Pont); bids in.

300 Tons, Niagara Falls, N. Y., additional building for Union Carbide & Carbon Co.; bids in.

350 Tons, Livingston County, N. Y., State highway bridge; Bero Engineering & Construction Corp., low bidder.

300 Tons, Philadelphia, chemistry building for University of Pennsylvania.

215 Tons, Baltimore, bottle storage building for National Brewing Co.

160 Tons, Philadelphia, extension to cast house for Midvale Co.

150 Tons, Iona Island, N. Y., Navy storage building.

125 Tons, Niagara Falls, N. Y., plant addition for Chisholm & Rider.

THE SOUTH

4500 Tons, Louisville, Ky., assembly shop for Navy Department.

595 Tons, Rutledge, Tex., spillway bridge at Marshall Ford Dam (Specification 945); bids Jan. 9.

CENTRAL STATES

5700 Tons, La Porte, Ind., 70 ammunition magazines for Government.

1700 Tons, Jeffersonville, Ind., two warehouses, Quartermaster depot, for War Department.

650 Tons, Cleveland, Government airplane hangar.

260 Tons, Murphysboro, Ill., State bridge, route SA-5, section 36-F.

225 Tons, Lorain, Ohio, amusement buildings for Carl Lertzman.

205 Tons, Conneaut, Ohio, factory building for General Electric Co.; bids in.

155 Tons, Cache, Ill., State bridge, route FA-144, section 19-F.

140 Tons, Winnetka, Ill., Tower Road grade separation for Cook County.

120 Tons, Ravenna, Ohio, monorail beams for shell loading plant; bids in.

FABRICATED PLATES

AWARDS

4000 Tons, Kankakee, Ill., water pipe line, to Chicago Bridge & Iron Co., Boston, through Stone & Webster, Inc., Boston, contractor.

PENDING PROJECTS

CANAL ZONE

564 Tons, Panama Canal, deck plates with necessary bolts and screws; bids opened Dec. 23.

SHEET PILING

AWARDS

10,000 Tons, San Pedro, Cal., for Navy fleet operating base, to Columbia Steel Co., San Francisco, through Guy F. Atkinson and George Pollock, contractors.

205 Tons, Groveport, Ohio, for Columbus & Southern Ohio Electric Co., to Carnegie-Illinois Steel Corp.

200 Tons, Seattle, Wash., McRae Brothers, to Bethlehem Steel Co., Bethlehem, Pa.

100 Tons, Guam Island, Navy rehabilitation, to Bethlehem Steel Co., Bethlehem, Pa.

Reinforcing Steel

Awards of 16,600 tons; 2900 tons in new projects.

AWARDS

ATLANTIC STATES

2000 Tons, Camden, N. J., New York Shipbuilding Corp., shipways, to Jones & Laughlin Steel Corp., Pittsburgh; Merritt-Chapman & Scott, contractors.

1100 Tons, Philadelphia, warehouses for Quartermaster Depot, 600 tons to Bethlehem Steel Co., Bethlehem, Pa., 500 tons to Concrete Steel Co., New York, through Wark Co., Philadelphia, general contractor.

250 Tons, Newport, R. I., Naval administration building foundation, to Concrete Steel Co., Boston, through O. D. Purington Co., Providence, R. I., contractor.

200 Tons, Annapolis, Md., recitation hall for Naval Academy, to Bethlehem Steel Co., Bethlehem, Pa.

100 Tons, Philadelphia, building for Pennsylvania Forge Corp., to Taylor-Davis, Inc., Philadelphia.

Weekly Bookings of Construction Steel

Week Ended——→	Dec. 23, 1940	Dec. 16, 1940	Nov. 26, 1940	Dec. 26, 1939	Year to Date 1940	Year to Date 1939
Fabricated structural steel awards	34,100	35,450	25,700	12,100	1,162,810	920,575
Fabricated plate awards	4,000	255	4,875	1,730	147,200	151,625
Steel sheet piling awards	10,505	0	200	200	76,135	75,565
Reinforcing bar awards	16,600	6,110	12,850	5,900	475,905	445,385
Total Letting of Construction Steel	65,205	41,815	43,625	19,930	1,862,050	1,593,150

100 Tons, Newport, R. I., Naval administration building, to Truceon Steel Co., Boston, through Gilbane Construction Co., Providence, R. I.

100 Tons, Lockport, N. Y., building for Hydraulic Race Co., to Truscon Steel Co., Youngstown, through H. F. Darling, contractor.

SOUTH AND CENTRAL

8000 Tons, Union Center, Ind., ammunition loading plant, to Inland Steel Co., Chicago, and Bethlehem Steel Co., Bethlehem, Pa., through Joseph T. Ryerson & Son, Inc., Chicago; Bates & Rogers, contractors.

2000 Tons, Robertson, Mo., Curtiss-Wright airplane factory to Laclede Steel Co., St. Louis, through H. B. Deal & Co., Inc., St. Louis, general contractor.

1600 Tons, Lockland, Ohio, Wright Aeronautical Corp., offices and machine shop, to Pollak Steel Co., Cincinnati; Frank Messer & Sons, contractors.

450 Tons, Cleveland, Sears-Roebuck Co., warehouse and office, to Bethlehem Steel Co., Bethlehem, Pa.

200 Tons, Detroit, Mich., Sisters of Mercy Hospital, to Bethlehem Steel Co., Bethlehem, Pa.

160 Tons, Cleveland, Nixon Apartment building to Builders Structural Steel Co., Cleveland.

110 Tons, Pensacola, Fla., Naval air station, to Truscon Steel Co., Youngstown, through Hardaway Construction Co., contractor.

100 Tons Bay City, Mich., Dow Chemical Co., plant, to Truscon Steel Co., Youngstown, through Austin Co., Cleveland, contractor.

100 Tons, Camp Lee, Va., Army cantonment, to Bethlehem Steel Co., Bethlehem, Pa., through Virginia Steel Co.; Doyle & Russell & Wise Construction Co., contractor.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

460 Tons, Pittsburgh, A. Leo Weil School, Siesel Construction Co., contractor.

350 Tons, Portland, Me., Martins Point bridge.

SOUTH AND CENTRAL

500 Tons, Cairo, Ill., housing project.

500 Tons, Cleveland, Government, aeronautical research laboratory, section B.

200 Tons, Oakland County, Mich., Ethyl Gasoline Corp., Laboratory Group.

100 Tons, Saginaw, Mich., C. K. Eddy, garage.

WESTERN STATES

600 Tons, Arsenal, Utah, two buildings at Army shell loading plant; Olson Construction Co., Lincoln, Neb., low bidder on general contract.

169 Tons, Corbett, Wyo., Heart Mountain Division, Shoshone Project (Invitation 48, 347-A); bids Dec. 27.

Cast Iron Pipe

Board of Selectmen, Plaquemine, La., asks bids until Dec. 30 for 4865 ft. of 6-in. pipe; also for hydrants, valves and other waterworks equipment. Hebert Brothers & Bean, Plaquemine, are engineers.

Siler City, N. C., plans pipe line extensions in water system. Cost about $22,000. Board of Water Commissioners will be in charge.

Jackson County Public Water Supply District No. 8, near Blue Springs, Mo., care of Henrici-Lowry Engineering Co., 1114 West Tenth Street, Kansas City, Mo., consulting engineer, plans pipe lines for water system in area of about 20 sq. miles in district noted, bounded by Woods Chapel Road from Highway 40 to Independence-Lees Summit Road; also other waterworks installation. Cost about $47,000. Bond issue in that amount is being arranged.

General Purchasing Officer, Panama Canal, Washington, asks bids until Jan. 3 for 6000 ft. of 6-in., cement-lined, cast iron water pipe; also for pressure reducing valves and reducing tees (Schedule 4658). Until Dec. 30 for 24 cast iron water pipe sleeves, bell and spigot bends, galvanized pipe hangers, etc. (Schedule 4636).

Water Department, City Hall, Newark, N. J., plans about one and one-half miles of 8-in. pipe in Broad Street, from Clay to Harvey Streets, for main water line. Cost about $60,000.

Beaumont, Tex., plans pipe line extensions and replacements in water system in district known as Section 1, including extensions in filter station to provide 6,000,000 gal. increased capacity, and 1,000,000-gal. steel storage tank on 140-ft. steel tower. Albert C. Moore & Co., Smith-Young Tower Building, San Antonio, Tex., consulting engineers, will make surveys and estimates of cost. Raymond Edmonds is city manager.

Crandon, Wis., plans pipe lines for water system and other waterworks installation. Cost about $125,000. Financing is being arranged through Federal aid. Jerry Donohue Engineering Co., 608 North Eighth Street, Sheboygan, Wis., is consulting engineer.

Water Department, Chattanooga, Tenn., plans about 20 miles of pipe for extensions in East Brainerd water system for supply in Silverdale, Shepherd, Tyner and Ryall Springs districts. A 200,000-gal. reservoir will be installed at Silverdale. Cost about $145,000. Financing has been arranged through Federal aid.

Oakland, Cal., East Bay Municipal Utility District has opened bids on 850 tons of 2, 4, 6 and 8-in. pipe (L. S. 257); United Pipe & Foundry Co., San Francisco, is low bidder.

Sacramento, Cal., will open bids Dec. 27 on 123 tons of 6-in. pipe and fittings.

Los Angeles Department of Water and Power took bids Dec. 23 on 3700 tons of 6, 8, and 12-in. pipe under Specification 3602.

Treasury Department, San Francisco, took bids Dec. 23 on 255 tons of 6-in. pipe for delivery WPA Yard, Oakland, Cal., under Invitation 10,212.

La Mesa, Lemon Grove, and Spring Valley Irrigation District, La Mesa, Cal., will take bids Jan. 7 on 565 or more tons of 4, 6, and 8-in. centrifugally cast cement-lined cast iron pipe.

Village Council, Woodstock, Ill., will soon engage engineer to make surveys and plans for pipe line extensions in water system, including new elevated steel tank and tower. Cost about $50,000.

East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, Cal., plans about 2500 ft. of 6-in. cement-lined pipe for extensions in water system on Cutting Boulevard, Richmond district.

Pipe Lines

Pure Oil Co., 35 East Wacker Drive, Chicago, plans new 6-in. welded steel pipe line from tank farm at Cumberland, Okla., to Armstrong, Tex., about 16 miles, for crude oil transmission. Connection will be made with pumping station for Texas pipe line system at latter place.

Constructing Quartermaster, Fort Benning, Ga., closes bids Jan. 6 for 6000 ft. of galvanized steel pipe; also for 4700 galvanized steel nipples, gate valves, reducing tees, pipe caps, elbows, etc. (Circular 6406-321).

Consumers Power Co., Jackson, Mich., has approved plans for new welded steel pipe line from gas field at Wise, Mich., to point near Dices Corners, vicinity of Midland, Mich., about 22 miles, for natural gas distribution. Connection will be made with main pipe line system of company at last noted point.

Corsicana, Tex., plans pressure pipe lines for municipal natural gas distribution system, including main welded steel pipe line for connection with supply source, meter house, control station and other facilities. Cost about $400,000.

Bureau of Reclamation, Denver, has low bid at $47,494.28 from R. Hardesty Mfg. Co., Denver, for 4 to 22-in. outside diameter fabricated steel pipe for South Ogden water distribution system, Ogden River project, Utah (Specification 1458-D).

Clark & Coopers, Inc., Midland, Tex., oil operator, plans steel pipe lines in connection with development of oil properties in Evans oil field area, Lea County, N. M., including gathering system.

Constructing Quartermaster, Fort Mason, San Francisco, has low bid from Conner & Brant, Inc., 1222 Whipple Street, Redwood City, Cal., at $32,995 for pressure pipe line systems for gas distribution at Forts Barry, Cronkhite and Baker, Cal. (Circular W-6616-41-78).

City Council, Inglewood, Cal., has let contract to Hood Construction Co., 3326 East Florence Avenue, Huntington Park, Cal., at $13,463.53 for 12-in. welded steel pipe line, about 6650 ft., dipped and wrapped, and 130 ft. of 16-in., in parts of Eucalyptus Avenue and Arbor Vitae Street, for main water lines.

Trade Notes

New England Screw Co. has moved its offices and factory from Farnsworth Street, Boston, to Keene, N. H.

M. D. Friedman Co., iron and steel scrap, which has yards at Ashland, Ky., and Huntington, W. Va., has moved its office from Ashland to Portsmouth, Ohio.

Industrial Equipment Co., Birmingham, Ala; Morgans, Inc., Savannah, Ga.; D. J. Murray Mfg. Co., Wausau, Wis., and George Rumble, Toronto, Can., have recently been appointed distributers of Murex heavy coated electrodes by Metal & Thermit Corp., New York.

Under a license agreement with Glenn L. Martin Co., Baltimore, the firm of Andrews and Perillo, Inc., of Long Island City, N. Y., will manufacture and market the Martin rivet sorter.

Name of The Harn Larmon Co., 2941 Spring Grove Avenue, Cincinnati, has been changed to The Nebel Machine Tool Co. A large new plant will be erected, located on the Parkway and Sassafras St. There will be no change in the present directors and officers of the company, Ferd. T. Nebel, president and treasurer, C. K. Nebel, vice-president, and O. M. Dock, secretary.

A. C. Harvey Co., Allston, Mass., which has been identified for years with the sale of steel products and welding equipment in New England, have been appointed jobbers of the line of Hobart "Multi-Range" arc welders, to collaborate with Leo Gordon of the New England distributing office.

Vulcan Rail & Construction Co. has moved into a new office and plant at 59-30 54th Street, Maspeth, New York City, and has enlarged its plant at Benwood, W. Va.

Beacon Steel Products Co., Inc., 12 East 41st Street, New York, announces its entry into the steel building products industry with Henry E. Braloff, formerly of the Seaboard Steel Products Corp., as president and general manager.

Lane Mfg. Co., Chicago, maker of small ignition parts, is moving its plant and equipment to space in the building formerly occupied by the Wells Mfg. Co., Fond du Lac, Wis. The executive staff will follow, but most of the factory labor will be hired in this city.

The machine shop section of the **Iron Products Corp.,** La Crosse, Wis., has been dismantled and will be shipped to Warrenton, Mo. The firm's foundry division will be kept here, according to C. R. Pieper, president, who was unable to say whether the personnel would be moved.

Sterling Electric Motors, Inc., has established an office at 11 West 42nd Street, New York, with Allen A. Adams as eastern manager.

Foote-Burt Co., Cleveland, has purchased the Hammond Mfg. Co., manufacturer of surface grinding machines and radial drilling machines.

Key Co., 2613 McCasland Avenue, East St. Louis, Ill., has equipped its plant with a machine shop for finishing of special or production runs of castings. The Key company long has furnished the oil refining industry with fittings for high pressure and high temperature service.

Prices of Finished Iron and Steel...

Steel prices on these pages are f.o.b. basing points (in cents per lb.) unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases freight absorbed to meet competition.

Basing Point → / ↓ Product	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	
Long ternes[2]	3.80¢		3.80¢									4.55¢			
Wrought iron	4.75¢														
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢		
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢		
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢								
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢		
TIN PLATE Standard cokes (Per 100-lb. base box)	$5.00	$5.00	$5.00						$5.10						
BLACK PLATE 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ (10)			
TERNES, M'FG. Special coated (Per base box)	$4.30		$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢		
Reinforcing (rail)[7]	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢				2.40¢	2.45¢	2.15¢		
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢							2.70¢		
PLATES															
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Coatesville and Claymont = 2.10¢)		2.45¢	2.65¢		2.29¢	2.15¢
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)										
SHAPES Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Bethlehem = 2.10¢)				2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Galvanized	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Spring	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)								
PILING Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			
IRON BARS Common		2.25¢			(Terre Haute, Ind. = 2.15¢)										
Refined	3.75¢														
Wrought	4.40¢														

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to 29 gage within certain width and length limitations. [6] For merchant trade. [7] Straight lengths as quoted by distributers. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lots to manufacturing trade. [10] Boxed.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher f.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Shell Steel

Basic open hearth shell steel f.o.b. Pittsburgh and Chicago.

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity. This type of steel is for hot rolled sections used for the forging of shells and includes rounds, round squares, and special sections.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)	*Per Lb.*
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 4/64 in., $3 a net ton higher. Quantity extras apply.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh; Package, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

WIRE PRODUCTS

(To the Trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham)

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cut nails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	56
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

Note: Birmingham base same on above items, except spring wire.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine and carriage bolts:	
½ in. and smaller by 6 in. and shorter	68
9/16 and ⅝ in. by 6 in. and shorter	66
¾ to 1 in. by 6 in. and shorter	64
1⅛ in. and larger, all lengths	62
All diameters over 6 in. long	62
Lag, all sizes	65
Plow bolts	68½
Hot pressed nuts; c.p.c., t-nuts; square, hex., blank or tapped:	
½ in. and smaller	66
9/16 to 1 in. inclusive	63
1⅛ in. to 1½ inclusive	61
1⅝ in. and larger	60

On above items, excepting plow bolts, additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts	U.S.S.	S.A.E.
½ in. and smaller	66	70
9/16 to 1 in.	63	65
1⅛ in. through 1½ in.	61	62
1⅝ in. and larger	60	..

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose	73 and 10
Stove bolts in packages, with nuts attached	73
Stove bolts in bulk	81

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York, lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.40

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 10

Cap and Set Screws

	Per Cent Off List
Milled hexagon head, cap screws, 1 in. dia. and smaller	50 and 10
Milled headless set screws, cut thread ¼ in. and larger	64
3/16 in. and smaller	73
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	70
Upset set screws, cup and oval points	75
Milled studs	52

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Dec. 17	Dec. 18	Dec. 19	Dec. 20	Dec. 21	Dec. 23
Copper, Electrolytic[1]	12.00	12.00	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00	12.00	12.00
Tin, Straits, New York	50.05	50.10	50.10	50.10	....	50.10
Zinc, East St. Louis[2]	7.25	7.25	7.25	7.25	7.25	7.25
Lead, St. Louis[3]	5.35	5.35	5.35	5.35	5.35	5.35

[1] Mine producers' quotations only, delivered Conn. Valley. Deduct ¼c. for approximate New York delivery price. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Products

Cents per lb., Delivered

	New York	Cleveland
Tin		
Straits pig	51.25	53.75
Copper		
Electro	12.75	13.50
Castings	12.50	13.00
H. R. Sheets*	20.12	20.12
Seamless tubes*	20.62	20.62
Brass		
Yellow sheets*	18.65	18.65
Yellow, rods*	13.67	13.67
Seamless tubes*	21.40	21.40
Zinc		
Slabs	Nom'al	Nom'al
Sheets, No. 9 casks	12.50	Nom'al
Lead		
American pig	6.50	6.00
Bar	8.45	8.50
Cut sheets	8.80	8.75
Antimony		
Asiatic	16.00	17.00
Aluminum		
Virgin, 99%	20.00	21.00
No. 1 remelt., 98-99%	18.00	18.50
Solder		
½ and ½	30.750	32.00
Babbitt		
Anti-friction grade	23.50	21.50

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their use.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper		
Hvy. crucible	10.00	10.625
Hvy. and wire	9.00	9.40
Light and bottoms	8.00	8.50
Brass		
Heavy	5.750	6.255
Light	4.750	5.50
No. 1 yel. turn.	5.50	6.50
No. 1 red or compo. turnings	8.75	9.25
Hvy. Mach. compo.	9.00	9.375
Lead		
Heavy	4.50	5.00
Aluminum		
Cast	10.50	11 50
Sheet	13.50	14.50
Zinc	5.00	5.25

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cents plus, 17c.-18c. a lb.; No. 12 remelt No. 2, standard, 15.25-16c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $165-$168 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 13.25c. a lb.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras; on copper sheets, 33⅓; on brass sheets and rods, 40; on brass tubes, 33⅓, and copper tubes, 40.

ALLOY STEEL

Alloy Steel Blooms, Billets and Slabs

Base per gross ton, f.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem.....$54.00

Alloy Steel Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade ..... 2.70c.
Delivered, Detroit ..... 2.80c.

S.A.E. Series Numbers	Alloy Differential, per 100 Lb.
2000 (1.5 Ni)	$0.35
2100 (1.5 Ni)	0.75
2300 (3.5 Ni)	1.70
2500 (5 Ni)	2.55
3100 Ni-Cr	0.70
3200 Ni-Cr	1.35
3300 Ni-Cr	3.80
3400 Ni-Cr	3.20
4100 Cr-Mo (0.15 to 0.25 Mo.)	0.55
4100 Cr-Mo (0.25 to 0.40 Mo.)	0.75
x4340 Cr-Ni-Mo	1.70
4340 Cr-Ni-Mo	1.85
4600 Ni-Mo (0.2-0.3 Mo, 1.5-2 Ni)	1.20
5100 (0.60-0.90 Cr)	0.35
5100 (0.80-1.10 Cr)	0.45
5100 Cr spring steel	0.15
52-100 Cr. (electric furnace)	2.60
6100 Cr-V bar	1.20
6100 Cr-V spring steel	0.85
C-V	0.85

The above differentials are for hot rolled finished products. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. Delivered Detroit, 3.45c., carlots.

Alloy Steel Plates

Base per lb., f.o.b. Pittsburgh, Chicago and Coatesville.

Open hearth grade .....3.50c.

What's Ahead for the New Year?

Plenty of problems, lots of work and an increasing number of new Iron Age readers—continuing the trend of 1940.

These readers are the men who buy and specify products like yours (if you sell to the metal-working industry). In their search for information they read Iron Age advertisements as well as editorial material.

This gives industrial advertisers the best medium in which to present information about their products to responsible executives in the country's largest industrial market. Advertise in the leading publication in 1941.

THE IRON AGE

100 East 42nd Street, New York

STAINLESS AND HEAT-RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chromium-Nickel

No.	304	302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium

No.	410	430	442	446
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
H'tstrip	17.00c.	17.50c.	24.00c.	35.00c.
C'ld st.	22.00c.	22.50c.	32.00c.	52.00c.

TOOL STEEL

(F.o.b. Pittsburgh)

	Base per Lb
High speed	67c.
High-carbon-chromium	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

ELECTRICAL SHEETS

(F.o.b. Pittsburgh)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. dock, San Francisco or Los Angeles or Seattle	56.00

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall

(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
1 in. o.d.13 B.W.G.	$9.01	$7.82	....
1¼ in. o.d.13 B.W.G.	10.67	9.26	....
1½ in. o.d.13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d.13 B.W.G.	13.42	11.64	11.06
2 in. o.d.13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d.13 B.W.G.	16.76	14.54	13.79
2¼ in. o.d.12 B.W.G.	18.45	16.01	15.16
2½ in. o.d.12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d.12 B.W.G.	21.42	18.59	17.54
3 in. o.d.12 B.W.G.	22.48	19.50	18.35
3½ in. o.d.11 B.W.G.	28.37	24.62	23.15
4 in. o.d.10 B.W.G.	35.20	30.54	28.66
4½ in. o.d.10 B.W.G.	43.04	37.35	35.22
5 in. o.d. 9 B.W.G.	54.01	46.87	44.25
6 in. o.d. 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over.....Base
30,000 lb. or ft. to 39,999 lb. or ft. 5%
20,000 lb. or ft, to 29,999 lb. or ft. 10%
10,000 lb. or ft. to 19,999 lb. or ft. 20%
5,000 lb. or ft. to 9,999 lb. or ft. 30%
2,000 lb. or ft. to 4,999 lb. or ft. 45%
Under 2,000 lb. or ft.....65%

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought iron pipe)

Base Price=$200 Per Net Ton

Butt Weld

Steel	Black	Galv.
⅛ in.	56	36
¼ to ⅜ in.	59	43½
½ in.	63½	54
¾ in.	66½	58
1 to 3 in.	68½	60½

Wrought Iron	Black	Galv.
¼ and ⅜ in.	+9	+10
½ in.	24	6½
¾ in.	30	13
1 and 1¼ in.	34	19
1½ in.	38	21½
2 in.	37½	21

Lap Weld

Steel		
2 in.	61	52½
2½ and 3 in.	64	55½
3½ to 6 in.	66	57¼
7 and 8 in.	65	55½
9 and 10 in.	64½	55
11 and 12 in.	63½	54
Wrought Iron		
2 in.	30½	15
2½ to 3½ in.	31½	17½
4 in.	33½	21
4½ to 8 in.	32½	20
9 to 12 in.	28½	15

Butt weld, extra strong, plain ends

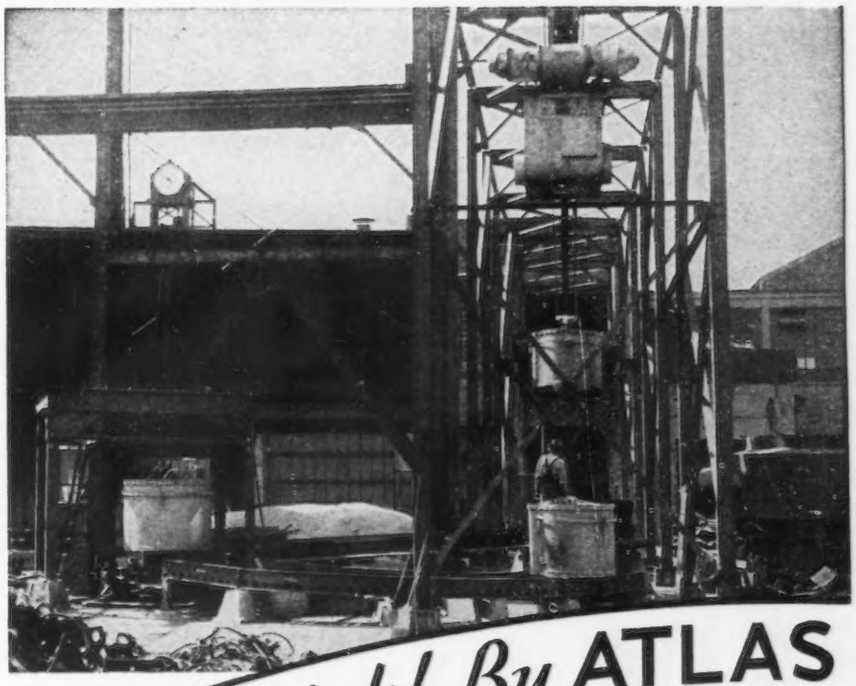
Steel	Black	Galv.
⅛ in.	54½	41½
¼ to ⅜ in.	56½	45½
½ in.	61½	53½
¾ in.	65½	57½
1 to 3 in.	67	60
Wrought Iron		
¼ and ⅜ in.	+10	+43
½ in.	25	9
¾ in.	31	15
1 to 2 in.	38	22½

Lap weld, extra strong, plain ends

Steel		
2 in.	59	51½
2½ and 3 in.	63	55½
3½ to 6 in.	66½	59
7 and 8 in.	65½	56
9 and 10 in.	64½	55
11 and 12 in.	63½	54
Wrought Iron		
2 in.	33½	18½
2½ to 4 in.	39	25½
4½ to 6 in.	37½	24
7 and 8 in.	38½	24½
9 to 12 in.	32	20½

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.



An Assist! By ATLAS

View at Prominent Iron Foundry

To Lower Costs!

Here Atlas-designed, Atlas-built equipment moves heavy scrap and other charging materials with consummate ease.

Monorail deposits empty bucket on roller conveyor. Bucket *rolls down* to scale platform, is charged with iron, weight read from yard crane cab. Scale platform lowers, turns, bucket *rolls down* to monorail for pick-up and charge to cupola.

A propitious circle, presaging profit at the year-end—and a definitely typical Atlas installation.

THE ATLAS CAR & MFG. CO.

Engineers **CLEVELAND, OHIO** ***Manufacturers***

serving the world with mobile handling equipment

ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton

Old range, bessemer, 51.50%..	$4.75
Old range, non-bessemer, 51.50%	4.60
Mesaba, bessemer, 51.50%.....	4.60
Mesaba, non-bessemer, 51.50%.	4.45
High phosphorus, 51.50%.....	4.35

Foreign Ores*

C.i.f. Philadelphia or Baltimore, Exclusive or Duty

Per Unit

Algerian, low P, Cu free, dry, 55 to 58% Fe	Nom.
Caucasian, washed, 52% Mn.	Nom.
African, Indian, 44 to 48% Mn.	50c.
African, Indian, 49 to 51% Mn.	54c.
Brazilian, 46 to 48% Mn.	50c.
Cuban, del'd, duty free, 51% Mn.	68c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered	$23 to $24
Tungsten, domestic scheelite, delivered	$23.00
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton: South African (low grade)	Nom.
Rhodesian, 45%	$23.50
Rhodesian, 48%	27.50

Your Electric Hoists Should Be "Shaw-Box"!

...They Cost Less To Operate

7 Reasons Why

Only in Shaw-Box Hoists can you get these features that make them the most economical hoists to use, and for the work they do the least expensive to buy.

1 — "One-Point" Lubrication System
2 — Interchangeable Suspension
3 — "Fool Proof" Upper Stop
4 — Two-Gear Reduction Drive
5 — "Hyatt" Roller Bearings
6 — Totally Enclosed Construction
7 — Ball Bearing Motors

Shaw-Box Electric Hoists are doing the lifting in thousands of plants across the country, in all industries — lifting jobs like yours . . . Always they have speeded production, taken the burden from men, lowered costs and increased profits.

In the Shaw-Box line of Electric Hoists you will find the one you seek for your own necessities . . . Sizes range from 250 pounds to 20 tons lifting capacity in combinations and arrangements to meet every requirement of industry . . . Back of them are the hoisting experiences of operating men in thousands of plants in all industries, and, the experience of more than half a century devoted to the development and manufacture of cranes and hoists exclusively.

Send for catalog that contains complete information and many illustrations of profit making installations that may suggest an application to you.

Makers of all types and sizes of Electric and Hand Operated Cranes, and Electric Hoists, including the famous Portable Electric "Budgit" Hoists . . . ***Send all your inquiries for cranes and hoists to "Shaw-Box"!***

SHAW BOX CRANE & HOIST DIVISION

MANNING, MAXWELL & MOORE, INC.

402 Broadway **MUSKEGON, MICHIGAN**

RAILS, TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., gross ton	$40.00
Angle bars, 100 lb.	2.70

F.o.b. Basing Points

Light rails (from billets), gross ton	$40.00
Light rails (from rail steel), gross ton	39.00

Base per Lb.

Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts, steam railroads	4.15c.
Track bolts, discount to jobbers all sizes (per 100 counts)	65-5

Basing points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minneaqua, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond, Va.

FLUORSPAR *Per Net Ton*

Domestic washed gravel, 85-5 f.o.b. Kentucky and Illinois mines, all rail	$20.00 to $21.00
Domestic, f.o.b. Ohio River landing barges	20.00 to 21.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines	20.00 to 21.00
Foreign, 85% calcium fluoride, not over 5% Si., c.i.f. Atlantic ports, duty paid	Nominal
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	31.00
As above, in bags, f.o.b. same mines	32.60

REFRACTORIES

Fire Clay Brick *Per 1000 f.o.b. Works*

Super-duty brick at St. Louis.	$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1 Ohio	39.90
Ground fire clay, per ton	7.10

Silica Brick

Pennsylvania	$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement, net ton (Eastern)	8.55

Chrome Brick *Net per Ton*

Standard f.o.b. Baltimore, Plymouth Meeting and Chester	$50.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	50.00

Magnesite Brick

Standard f.o.b. Baltimore and Chester	$72.00
Chemically Bonded, f.o.b. Baltimore	61.00

Grain Magnesite

Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	(—)*
Domestic, f.o.b. Baltimore and Chester in sacks	$40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

*None available.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload).....$120.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%.....$36.00
Domestic, 26 to 28%..... 49.50

Electric Ferrosilicon

Per Gross Ton, Delivered, Lump Size

50% (carload lots, bulk).....$74.50*
50% (ton lots, packed)..... 87.00*
75% (carload lots, bulk).....135.00*
75% (ton lots, packed).....151.00*

Bessemer Ferrosilicon

Per Gross Ton, F.o.b. Jackson, Ohio

10.00 to 10.50%.....$33.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2% $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton, F.o.b. Jackson, Ohio

5.00 to 5.50%.....$27.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots Lump Size, on Contract

4 to 6% carbon.....11.00c.
2% carbon .....17.50c.
1% carbon .....18.50c.
0.10% carbon .....20.50c.
0.06% carbon .....21.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon $113.00*
2.50% carbon 118.00*
2% carbon 123.00*
1% carbon 133.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W, del. carload..... $2.00
Ferrotungsten, 100 lb. and less 2.25
Ferrovanadium, contract, per lb. contained V, del'd $2.70 to $2.90†
Ferrocolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., ton lots ..... $2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace, carload and contract, per net ton.....$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton.....$157.50

*Spot prices are $5 per ton higher.
†Spot prices are 10c. per lb. of contained element higher.

Ferrophosphorus, electric or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton 58.50
Ferrophosphorus, electrolytic 23-26% in carlots, f.o.b. Monsato (Siglo), Tenn., 24%, per gross tons, $3 unitage, freight equalized with Nashville 75.00
Ferromolybdenum, per lb. Mo, f.o.b. furnace ..... 95c.
Calcium molybdate, per lb. Mo, f.o.b. furnace ..... 80c.
Molybdenum oxide briquettes 48-52% Mo, per lb. contained Mo, f.o.b. Langeloth, Pa. 80c.

FUEL OIL

No. 3, f.o.b. Bayonne, N J.....4.50c.
No. 6, f.o.b. Bayonne, N. J.....2.98c.
No. 5 Bur. Stds., del'd Chicago..3.25c.
No. 6 Bur. Stds., del'd Chicago..2.75c.
No. 3 distillate, del'd Cleveland..5.25c.
No. 4 industrial, del'd Cleveland.5.00c.
No. 5 industrial, del'd Cleveland.4.25c.
No. 6 industrial, del'd Cleveland.3.63c.

NOW... Pickling Combs in ANY SHAPE YOU LIKE

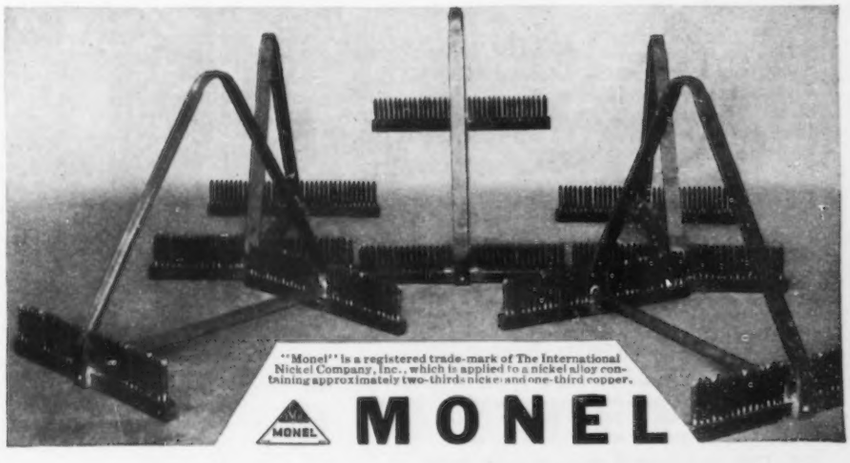
Welded Monel construction permits wide latitude in design

Not much you can do about improving design of pickling combs if you're limited to only *one* method of fabrication. But use Monel and you can turn out just the kind of comb you need.

Available in all standard mill forms, Monel is easy to work with. Cut it, bend it, shape it any way you like. Then permanently join the parts by means of strong, sound welds. Result: A comb shaped *exactly* the way you want it . . . and good for extra-long service because Monel is both tough and resistant to corrosion.

For more information on the use of Monel for pickling equipment write for "Equipment Designs for the Pickle House" and for welding data. Address:

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York, N. Y.


"Monel" is a registered trade-mark of The International Nickel Company, Inc., which is applied to a nickel alloy containing approximately two-thirds nickel and one-third copper.
MONEL
MONEL

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, prompt .....$5.25 to $5.75

Foundry, f.o.b. Connellsville, prompt .....$5.50 to $6.00

F'dry, by-product, Chicago..... 10.50

F'dry, by-product, New England 13.00

Foundry, by-product, Newark or Jersey City .....$11.30 to $11.90

F'dry, by-product, Philadelphia. 11.13

F'dry, by-product, Cleveland... 11.55

F'dry, by-product, Cincinnati... 11.00

Foundry, Birmingham 7.50

F'dry, by-product, St. Louis $10.75 to $11.00

Foundry, from Birmingham, f.o.b. cars dock Pacific ports.....$14.75

BRITISH

British

Per Gross Ton, f.o.b. United Kingdom Ports

Ferromanganese, export.£17 18s.

Tin plate, per base box. 32s. to 33s.

Steel bars, open hearth.£13 9s.

Beams, open hearth....£12 2s. 6d.

Channels, open hearth..£12 2s. 6d.

Angles, open hearth....£12 2s. 6d.

Black sheets, No. 24, gage £18 17s. 6d. max.*; £18 17s. 6d. min.**

Galvanized sheets, No. 24 gage £19 10s. max.*; £19 10s. min.**

*Empire markets only.
**Other than Empire markets.

PIG IRON (Per Gross Ton)

Prices delivered various consuming points indicated by bold italics

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos.
Boston	***$25.50***	***$25.00***	***$26.50***	***$26.00***	.....
Brooklyn	***27.50***	.....	.....	***28.00***	.....
Jersey City	***26.53***	***26.03***	***27.53***	***27.03***	.....
Philadelphia	***25.84***	***25.34***	***26.84***	***26.34***	.....
Bethlehem, Pa.	$25.00	$24.50	$26.00	$25.50	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....
Steelton, Pa.	.....	24.50	.....	.....	28.50
Birdsboro, Pa.	25.00	24.50	26.00	25.50	28.50
Sparrows Point, Md.	25.00	24.50	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....
Sharpsville, Pa.††	24.00	23.50	24.50	24.00	.....
Buffalo	24.00	23.00	25.00	24.50	28.50
Cincinnati	***24.44***	***24.61***	.....	***25.11***	.....
Canton, Ohio	***25.39***	***24.89***	***25.89***	***25.39***	.....
Mansfield, Ohio	***25.94***	***25.44***	***26.44***	***25.94***	.....
St. Louis	***24.50***	***24.02***	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	.....
Granite City, Ill.	24.00	23.50	24.50	24.00	.....
Cleveland	24.00	23.50	24.50	24.00	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....
Toledo	24.00	23.50	24.50	24.00	.....
Youngstown††	24.00	23.50	24.50	24.00	.....
Detroit	24.00	23.50	24.50	24.00	.....
St. Paul	***26.63***	.....	***27.13***	***26.63***	.....
Duluth	24.50	.....	25.00	24.50	.....
Birmingham	19.38*	18.00	24.00	.....	.....
Los Angeles, San Francisco and Seattle	***27.50***	.....	.....	.....	.....
Provo, Utah	22.00	.....	.....	.....	.....
Montreal†	27.50	27.50	.....	28.00	.....
Toronto†	25.50	25.50	.....	26.00	.....

GRAY FORGE

Valley or Pittsburgh fce.....$24.50

CHARCOAL

Lake Superior fce.....$27.00
Delivered Chicago 30.34

Base prices are subject to an additional charge for delivery within the switching limits of the respective districts.

*Delivered prices on Southern iron for shipment to Northern points are 38c. a ton below delivered prices from nearest Northern basing point on iron with phosphorus content of 0.70 per cent and over. †On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

WAREHOUSE PRICES

(Base Prices, Dollars per 100 lb., Delivered Metropolitan Areas)

	Pittsburgh	Chicago	Cleveland	Philadelphia	New York	Detroit	Buffalo	Boston	Birmingham	St. Louis	St Paul	Milwaukee	Los Angeles
Sheets, hot rolled	$3.15	$3.05	$3.15	$3.35	$3.38	$3.23	$3.05	$3.51	$3.45	$3.19	$3.30	$3.48	$4.30
Sheets, cold rolled	....	4.10	4.05	4.05	4.40	4.30	4.30	4.58	...	4.12	4.35	4.43	6.50
Sheets, galvanized	4.75	4.60	4.42	4.75	4.55	4.64	4.40	4.66	4.75	4.95	4.75	4.98	5.25
Strip, hot rolled	3.40	3.40	3.30	3.75	3.76	3.48*	3.62	3.86	3.70	3.54	3.65	3.73	...
Strip, cold rolled	3.20	3.30	3.20	3.31	3.31	3.20	3.22	3.26	....	3.41	3.83	3.54	....
Plates	3.40	3.55	3.40	3.55	3.76	3.60	3.62	3.85	3.35	3.47	3.80	3.68	4.00
Structural shapes	3.40	3.55	3.58	3.55	3.75	3.65	3.40	3.85	3.55	3.69	3.80	3.68	4.15
Bars, hot rolled	3.35	3.50	3.25	3.85	3.84	3.43	3.35	3.98	3.50	3.64	3.75	3.63	4.15
Bars, cold finished	3.65	3.75	3.75	4.06	4.09	3.80	3.75	4.13	4.43	4.02	4.34	3.88	6.60
Bars, ht. rld. SAE 2300	7.20	7.10	7.55	7.31	7.35	7.42	7.35	7.50	....	7.47	7.45	7.33	9.40
Bars, ht. rld. SAE 3100	5.75	5.65	5.85	5.86	5.90	5.97	5.65	6.05	....	6.02	6.00	5.88	8.55
Bars, cd. drn. SAE 2300	8.15	8.15	8.15	8.56	8.59	8.45	8.40	8.63	....	8.52	8.84	8.38	10.65
Bars, cd. drn. SAE 3100	6.75	6.75	6.75	7.16	7.19	7.05	6.75	7.23	....	7.12	7.44	6.98	9.80

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb.; galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions: Chicago, galvanized sheets, 500 to 1499 lb.; Philadelphia, galvanized sheets, one to nine bundles, cold rolled sheets, 1000 to 1999 lb.; Detroit, galvanized sheets, 500 to 1499 lb.; Buffalo, cold rolled sheets, 500 to 1500 lb., galvanized sheets, 450 to 1499 lb.; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; Birmingham, hot rolled sheets, strip and bars, plates and shapes, 400 to 3999 lb., galvanized sheets, 500 to 1499 lb.; St. Louis, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb.; Milwaukee, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 150 to 499 lb.; New York, hot rolled sheets, 0 to 1999 lb., cold rolled sheets, 400 to 1499 lb.; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lb.; Los Angeles, hot rolled sheets, bars, plates, shapes, cold rolled sheets, 300 to 1999 lb., galvanized sheets, 150 to 1049 lb. Extras for size, quality, etc., apply on above quotations. *12 gage and heavier, $3.23.

Sales Possibilities

. . . CONSTRUCTION, PLANT EXPANSION AND EQUIPMENT BUYING

North Atlantic States

• **Torrington Co.**, Torrington, Conn., swaging machinery, ball bearings, small metal goods, etc., has let general contract to Torrington Building Co., 187 Church Street, for one-story addition, 85 x 150 ft. Cost close to $90,000 with equipment.

United States Engineer Office, Providence, R. I., asks bids until Dec. 30 for pumping machinery for pumping station on Circuit Avenue, West Springfield, Mass., including two 24-in. vertical, mixed-flow, volute-type pumping units, with inlet and discharge piping, gate and check valves; and two four-cycle, heavy-duty, stationary-type, internal combustion engines, with silencers and exhaust piping, for operation of pumps noted; and two right-angle gear units for connecting pumps and gasoline engines.

Bethlehem Steel Co., Shipbuilding Division, Quincy, Mass., will carry out further expansion in shipbuilding plant to provide additional shops, shipways and production facilities for construction of vessels for Government. Company has contracted with Navy Department for fund of $800,000 for project.

Waterbury Lock & Specialty Co., Milford, Conn., will take bids at once for one-story plant addition, about 45 x 160 ft. Cost over $65,000 with equipment. Brown & Von Beren, Inc., 285 Sherman Street, New Haven, Conn., is architect.

American Hardware Corp., Corbin Screw Division, New Britain, Conn., bolts, screws, chains, etc., has let general contract to Carlson & Torrel, Inc., Dwight Street, for one-story addition. Cost close to $45,000 with equipment.

Norton Co., Worcester, Mass., has let general contract to E. J. Cross Co., 150 Prospect Street, for four-story addition, 51 x 100 ft. Cost over $100,000 with equipment.

Rheem Mfg. Co., 30 Rockefeller Plaza, New York, steel drums and other steel containers, has let general contract to Brown & Matthews, Inc., 122 East Forty-second Street, for one-story addition, about 100,000 sq. ft. of floor space, at branch plant at Sparrows Point, Baltimore, comprising further expansion in that works, where large extension recently was completed. New unit will cost close to $300,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 3 for one motor-driven contour metal sawing, filing and polishing machine (Schedule 4505) for New York yard.

Johns-Manville Corp., 22 East Fortieth Street, New York, building products, insulating specialties, etc., has let general contract to George Belanger & Son, Inc., 308 Main Street, Nashua, N. H., for one and two-story addition, 50 x 640 ft., to branch plant at Nashua, for storage and distribution. Cost over $175,000 with equipment.

Union Carbide & Carbon Corp., 30 East Forty-second Street, New York, industrial chemicals, plastic products, etc., has let general contract to Turner Construction Co., 420 Lexington Avenue, for new one-story plant at Bound Brook, N. J., adjoining works of Bakelite Corp., a subsidiary, for production of plastics. It will comprise main unit, 255 x 460 ft., for molding, plasticizing and other processing work, and adjoining structure, 69 x 150 ft., for auxiliary production service. Cost close to $2,500,000 with equipment. Francisco & Jacobus, 511 Fifth Avenue, New York, are architects and engineers.

Agawam Aircraft Products, Inc., Sag Harbor, L. I., recently organized by Albert P. Loening, Southampton, L. I. (mayor of that place), and associates, has leased one-story building on Bay Street for production of machined parts for airplanes. Mr. Loening will be president of new company.

Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bids until Dec. 31 for 2-kw. power units (Circular 373).

Lamson Co., Inc., Lamson Street, Syracuse, N. Y., conveyors and other mechanical-handling equipment, has let general contract to J. D. Taylor Construction Corp., 115 South Salina Street, for one-story addition, 45 x 200 ft. Cost close to $100,000 with equipment.

John Deere Plow Co., 125 Marcellus Street, Syracuse, N. Y., agricultural implements and equipment, plans one-story factory branch, storage and distributing plant at Colonie, N. Y. Cost about $65,000 with equipment. Main offices are at Moline, Ill.

E. I. du Pont de Nemours & Co., Inc., R. & H. Chemicals Division, Buffalo Avenue, Niagara Falls, N. Y., has let general contract to Laur & Mack Contracting Co., Inc., 1400 College Avenue, for one-story addition. Cost over $65,000 with equipment.

Wilcolator Co., 17-23 Nevada Street, Newark, N. J., heat-control devices and equipment, has purchased former plant of Elastic Stop Nut Corp., 1001 Newark Avenue, Elizabeth, N. J., consisting of one and two-story buildings, about 31,000 sq. ft. of floor space, for new plant, and will remove present works to that location for increased output. Elastic Stop Nut Corp. is removing to a larger plant at Union, N. J.

Federal Shipbuilding & Dry Dock Co., Kearny, N. J., has let general contract to Austin Co., Cleveland, for one-story machine shop addition. Cost close to $175,000 with equipment. Another award has been made to Walter Kidde Constructors, Inc., 140 Cedar Street, New York, for one-story addition to mold loft. Cost over $150,000 with equipment. Company has contracted with Navy Department, Washington, for further expansion in shops and ways for construction of destroyers and other Government vessels, and will secure Federal fund of $2,250,000 for project.

Condenser Service & Engineering Co., 310 Twelfth Street, Hoboken, N. J., turbines, condensers, etc., plans rebuilding part of plant recently destroyed by fire. Loss over $400,000 with equipment.

American Armament Corp., 6 East Forty-fifth Street, New York, has acquired vacant plant of Carrier Corp., Syracuse, N. Y., at Allentown, Pa., and will modernize for production of machine guns, anti-aircraft guns and parts, etc., for Government. Cost about $500,000 with equipment.

Empire Steel Castings, Inc., Temple, Pa., has begun superstructure for one-story addition. E. A. Reider, 110 South Tenth Street, Reading, Pa., is general contractor. Cost over $60,000 with equipment.

Doehler Die Casting Co., High and Washington Streets, Pottstown, Pa., plans one-story addition. Cost close to $50,000 with equipment. Main offices are at 386 Fourth Avenue, New York.

Aero Supply Mfg. Co., Corry, Pa., screw products for airplanes, has let general contract to J. M. Benzinger, Inc., 121 West Fourth Street, Jamestown, N. Y., for two-story addition, 120 x 190 ft. Cost close to $175,000 with equipment. Mayers & Johnson, Commerce Building, Erie, Pa., are architects.

Molded Insulation Co., 335 East Price Street, Philadelphia, plastic products, has asked bids on general contract for three-story addition, 50 x 175 ft. Cost close to $125,000 with equipment. F. Dickinson Shaw, 34 South Seventeenth Street, is consulting engineer; John W. Keyes, 112 South Sixteenth Street, is architect.

General Purchasing Officer, Panama Canal, Washington, asks bids until Dec. 30 for 6000 ft. of non-climbable type chain link fabric for fencing, gate posts, line posts, double swing gates, 6000 ft. of top rail, and auxiliary wire-fencing materials (Schedule 4638).

Glenn L. Martin Co., Baltimore, has asked bids for several one-story additions for expansion in parts production and assembling departments for manufacture of military aircraft for Government. Cost over $600,000 with equipment. Albert Kahn Associated Architects & Engineers, Inc., Detroit, is architect and engineer.

Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md., asks bids until Dec. 30 for two screw-type and two press-type closing machines (Circular 699).

National Brewing Co., Conkling and O'Donnell Streets, Baltimore, has asked bids on general contract for one-story addition for storage and distribution. Cost close to $45,000 with equipment. P. W. Backus is company engineer.

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for diesel engine electric alternator, air-starting equipment, fuel oil purifier, trolley hoist, cooling tower, piping, switchgear, instruments, etc., for naval radio station, Cheltenham, Md. (Specification 10079); also bids (no closing date stated) for oil-fired incinerator unit, piping, accessories, etc., for same station (Specification 10087).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 2 for four motor-driven upright drills (Schedule 4535), eight drill grinders (Schedule 4515), four 16-in. crank shapers, all without motors (Schedule 4517), for Sewall's Point, Va., and Mare Island Navy yards; four motor-driven, jack knife-type radial arm drills (Schedule 4512), steel wool (Schedule 4540) for Eastern and Western yards.

The South

• **Dayton Rubber Mfg. Co.**, Dayton, Ohio, automobile tires and tubes, mechanical rubber goods, etc., plans branch mill at Hazelwood, N. C., where about 20 acres have been acquired. It will comprise main one-story unit and auxiliary structures for storage and distribution, with machine shop and power house. Cost over $100,000 with equipment.

George Wiedemann Brewing Co., 601 Columbia Street, Newport, Ky., has let general contract to Fisher-DeVore Construction Co., 3629 Idlewild Street, Cincinnati, for modernization and extensions. Cost about $50,000 with equipment. Fosdick & Hilmer, Union Trust Building, Cincinnati, are consulting engineers.

National Oil Products Co., Essex Street, Harrison, N. J., has let general contract to Wright & Lopez, Cedartown, Ga., for one-story addition to branch plant at Cedartown. Cost close to $65,000 with equipment. This is part of expansion to be carried out at local plant, entire projection to cost about $150,000.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 3 for 40 underground gasoline tanks, each 5000-gal. capacity, for Charleston, S. C., Navy Yard; also for 30 and 50 similar tanks for New York and Mare Island yards respectively (Schedule 4488); three motor-driven, saddle-type turret lathes for Charleston and Norfolk yards; also for 10 and three similar lathes for Boston and Mare Island yards respectively (Schedule 4525).

Board of Port Commissioners, New Orleans, has asked bids on general contract for one-story building and warehouse, 160 x 500 ft., near turning basin on inner harbor navigation canal. Cost over $100,000 with conveyors, hoists and other mechanical-handling equipment.

Williams Roofing Co., East Second Street,

Little Rock, Ark., plans one-story plant, about 120 x 320 ft., in stockyards district, South Camden, Ark., to replace a plant at Waterloo, Ark., recently destroyed by fire. Cost over $85,000 with equipment.

United States District Engineer, Charleston, S. C., will prepare plans for new air base at Charlotte, N. C., where site has been secured near municipal airport, to include hangars, machine and reconditioning shops, oil storage and distribution tanks and facilities, and other structures. Fund of $1,235,800 has been authorized for project. Proposed to award contract on cost-plus basis.

City Council, Fredericksburg, Va., plans extensions and improvements in municipal gas plant, including additional equipment. A bond issue has been arranged.

Central States

• **Delco Products Division,** General Motors Corp., 329 East First Street, Dayton, Ohio, electric motors, motor starters, etc., has let general contract to Charles H. Shook, Inc., 582 West Second Street, for seven-story and basement addition, 92 x 242 ft. Cost over $1,000,000 with equipment.

White Motor Co., Inc., 842 East Seventy-ninth Street, Cleveland, has asked bids on general contract for one-story addition, about 38,200 sq. ft. of floor space, for expansion in assembling and inspection divisions, particularly for production of scouting cars for War Department. Cost about $125,000 with equipment.

General Electric Co., Nela Park, Cleveland, has let general contract to A. M. Higley Co., 2036 East Twenty-second Street, for one-story and basement addition, 80 x 290 ft. Cost over $100,000 with equipment.

Aluminum Industries, Inc., 2438 Beekman Street, Cincinnati, automotive pistons, pins, etc., and aluminum alloy castings, has let contract to Austin Co., Cleveland, for new plant on 25-acre tract at Bridgetown and Werk Roads, to include foundry, machine shop, paint shop, service building and office, with storage and distribution buildings, boiler house and other structures, totaling about 500,000 sq. ft. of floor space. Cost over $1,750,000 with equipment.

McGean Chemical Co., Republic Building, Cleveland, industrial chemicals, has let general contract to Sam W. Emerson Co., 1836 Euclid Avenue, for one-story addition to plant at 2910 Harvard Avenue, 50 x 150 ft. Cost over $60,000 with equipment.

Porter Machine Co., 3120 Forrer Street, Oakley, Cincinnati, machinery and parts, has let general contract to E. S. Hunter, 3529 Woodburn Avenue, for one-story machine shop and office. Cost close to $50,000 with equipment. Samuel Hannaford & Sons, Dixie Terminal Building, Cincinnati, are architects.

Marmon-Herrington Co., 1511 West Washington Street, Indianapolis, commercial automobiles and parts, has let general contract to H. K. Ferguson Co., Cleveland, for one-story machine shop addition, 60 x 100 ft. Cost about $50,000 with equipment. F. W. Daniels, Hanna Building, Cleveland, is architect.

South Bend Tool & Die Co., 1916 South Main Street, South Bend, Ind., tools, gages, dies, etc., plans one-story addition. Cost about $40,000 with equipment. Willard E. Ellwood, Christman Building, is architect.

North American Aviation Corp., Inglewood, Cal., airplanes and parts, plans new plant at Reimer Street and Fairfax Road, Kansas City, Kan., for assembling military planes for Government, which will finance project, parts to be furnished by outside plants. It will comprise two main one-story structures, 950 x 955 ft., for assembling division, and 50 x 150 ft., for administration building; also other buildings for storage and distribution, with power house. Cost about $8,000,000 with equipment. J. Lloyd Allen and John R. Kelley, Architects' and Builders' Building, Indianapolis, are architects; Col. Gordon Turnbull, last noted address, is consulting engineer.

Continental Can Co., 100 East Forty-second Street, New York, has asked bids on general contract for one-story plant, 440 x 460 ft., with one and two-story adjoining building, 340 x 400 ft., for storage and distribution, and office facilities, on 15-acre tract at North Broadway and Humboldt Street, St. Louis, recently acquired. Cost over $1,000,000 with equipment. W. W. Taylor, manager of company construction division, 4633 West Grand Avenue, Chicago, is in charge. Company is now operating a St. Louis plant at 5221 Natural Bridge Avenue.

City Council, Carrollton, Mo., will take bids soon for equipment for municipal power plant, including diesel engine-generator unit and accessories, cooling tower, switchgear and auxiliaries. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Carter-Gregg Oil Co., Forth Worth, Tex., plans new gas recycling plant in oil field near Cayuga, Tex., with compressor station, steel tank storage division and other facilities. Cost about $150,000 with equipment.

Chicago Bridge & Iron Co., Chicago, elevated steel tanks, standpipes, gas holders and other products, plans one-story factory branch, storage and distributing plant on Clinton Drive, Houston, Tex., with main unit, 60 x 160 ft., and smaller buildings. A machine shop will be installed; also two and three-ton electric hoists, and other mechanical-handling equipment. Cost close to $90,000 with equipment.

Nineteen Hundred Corp., St. Joseph, Mich., washing machines and parts, has let general contract to Stock Construction Co., St. Joseph, for new two-story and basement plant, 80 x 125 ft., in Edgewater district. Cost about $75,000 with equipment. Main offices are at Binghamton, N. Y.

Wilcox-Rich Division, Eaton Mfg. Co., 9771 French Road, Detroit, engine valves, valve tappets and other automotive equipment, has let general contract to Fred C. Trier, Saginaw, Mich., for one-story addition to branch plant at Saginaw. Cost about $85,000 with equipment.

Duplex Printing Press Co., Battle Creek, Mich., has let general contract to Stewart Ferguson, Battle Creek, for one-story addition. Cost over $50,000 with equipment. Edward Tuttle, Battle Creek, is architect.

Black River Foundry Co., Grand Haven, Mich., brass, bronze and other metal castings, will take bids soon on general contract for one-story addition, 150 x 315 ft. Cost close to $140,000 with equipment.

Owens-Illinois Can Co., 6501 West Sixty-fifth Street, Chicago, metal cans and containers, has let general contract to Hughes-Foulkrod Co., 1505 Race Street, Philadelphia, for three-story addition, 160 x 360 ft., for expansion in production, storage and distributing departments. Cost about $300,000 with equipment. Company is a subsidiary of Owens-Illinois Glass Co., Toledo, Ohio.

Shell Oil Co., Shell Building, St. Louis, plans addition to oil refinery at Wood River, Ill., for solvent extraction plant for production of naphtha, cleaning solvents, etc., under new process. Cost over $500,000 with equipment.

Woodward Governor Co., 216-18 Mill Street, Rockford, Ill., governors for hydraulic turbines and kindred equipment, will take bids soon on general contract for one-story addition, 220 x 226 ft., and 90 and 390 ft., with two-story center section, 80 x 80 ft. Cost over $175,000 with equipment. Harza Engineering Co., 208 West Wacker Drive, Chicago, is consulting engineer.

Pioneer Engineering Works, Inc., 1515 Central Avenue, Minneapolis, Minn., machinery and equipment for sand and gravel plants, will take bids at once on general contract for one-story addition, 60 x 160 ft. Cost over $50,000 with equipment. A. B. Dunham and E. R. Ludwig, Essex Building, are architects.

Independent Pneumatic Tool Co., 600 West Jackson Boulevard, Chicago, has approved plans for one-story addition to branch plant at 6200 East Slauson Avenue, Los Angeles, operated in name of Cochise Rock Drill Mfg. Co., about 25,000 sq. ft. of floor space, for expansion in aircraft tool division. Cost close to $500,000 with equipment.

City Council, New Ulm, Minn., plans expansion and improvements in municipal power plant, including new steam-generating unit and auxiliary equipment. Cost about $150,000. Ralph D. Thomas & Associates, Inc., 1200 Second Avenue, South, Minneapolis, is consulting engineer.

Western States

• **Seattle-Tacoma Shipbuilding Co.,** Seattle, plans new shops, shipway extensions and other facilities for construction of destroyers and other vessels for Navy Department, with which company has contracted for fund of $1,400,000 for project.

Garrett Corp., 5957 West Third Street, Los Angeles, aircraft parts and equipment, has let general contract to Buttress & McClellan, Inc., 1013 East Eighth Street, for new one-story plant, 200 x 385 ft. Cost over $150,000 with equipment. Hugo Eckart, last noted address, is architect.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 3 for commercial chain, detachable links for die-lock chain, shackle tool sets for ⅞-in. detachable links, and taper locking pins for use with ⅞-in. detachable links (Schedule 4174), 150 aluminum-alloy clothes lockers (Schedule 4489) for Mare Island Navy Yard.

Pennsylvania Salt Mfg. Co., Widener Building, Philadelphia, industrial chemicals, plans new works on 50-acre tract on Willamette River, near Portland, Ore., for production of sodium, potassium chlorates and kindred products. It will comprise one and multi-story production units, with storage and distributing buildings, machine shop, power substation and auxiliary structures. Power will be secured from Bonneville power transmission system, with high-tension line built to site. Cost over $1,300,000 with equipment.

Morrow Aircraft Corp., East Third Street, San Bernardino, Cal., airplanes and parts, has awarded general contract to Buttress & McClellan, Inc., 1013 East Eighth Street, Los Angeles, for new one-story plant, for parts production and assembling. Cost about $75,000 with equipment. Company formerly was known as Crosby Aircraft Corp.

Bureau of Reclamation, Denver, asks bids until Jan. 10 for one 100-ton gantry crane for handling fixed-wheel penstock gates at Parker hydroelectric power plant, Parker Dam project, Ariz. (Specifications 944).

Rayonier, Inc., Hoquiam, Wash., has approved plans for new turbine house at sulphite pulp mills, with installation of new 2000-kw. turbine-generator unit and auxiliary equipment. Cost about $85,000 with equipment.

Canada

• **Gosselin Foundry, Ltd.,** Drummondsville, Que., iron and other metal castings, will soon begin superstructure for two-story addition, 50 x 150 ft. Laferte & Robidas, Ltd., 202 du Moulin Street, is general contractor. Cost close to $75,000 with equipment.

Port Arthur Shipbuilding Co., Ltd., Port Arthur, Ont., plans one-story shop addition. Cost close to $60,000 with equipment.

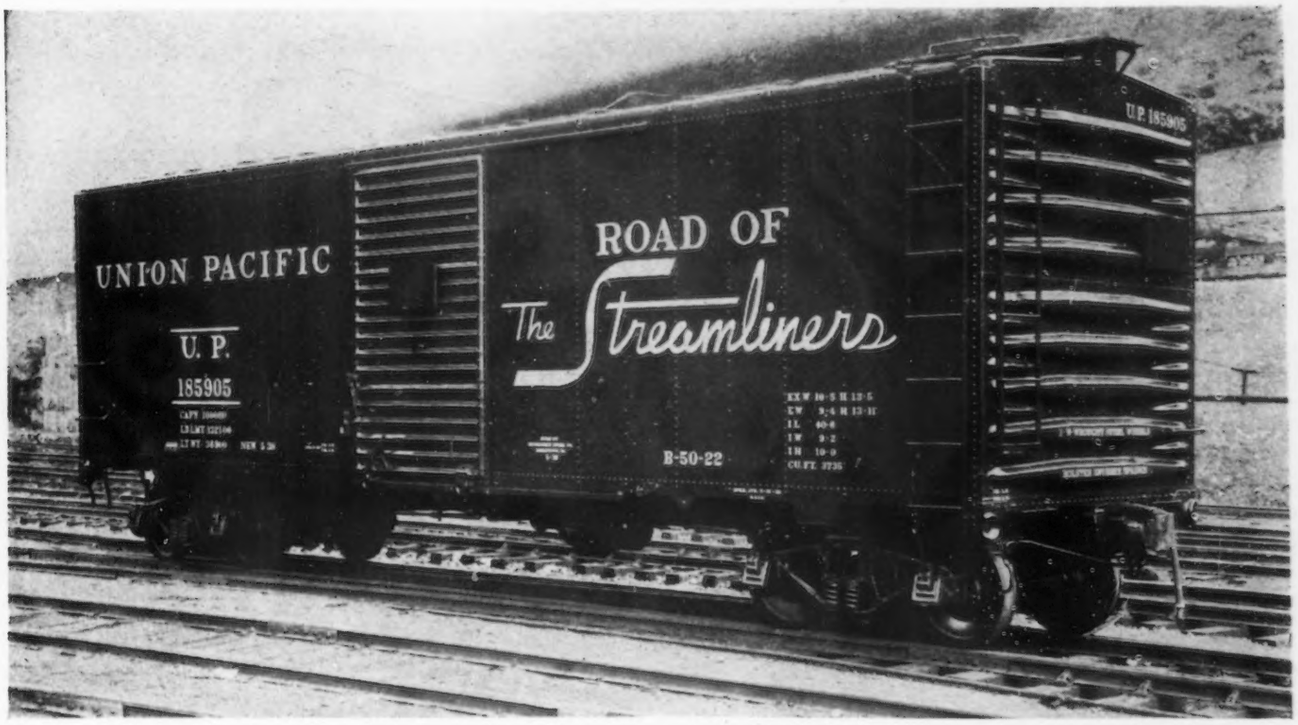
Canada Durex Abrasives, Ltd., Brantford, Ont., grinding wheels and abrasive products, is erecting one-story addition, for which general contract recently was let to Cromar Construction Co., Ltd., 448 Colborne Street. Cost close to $50,000 with equipment.

Steel Co. of Canada, Ltd., Hamilton, Ont., has awarded structural steel contract to Hamilton Bridge Co., Ltd., Bay Street, North, for one story, 100 x 400 ft., plant addition. Hutton & Souter, 36 James Street South, are architects.

Empire Brass Mfg. Co., Ltd., Dundas Street East, London, Ont., has let general contract to Pigott Construction Co., Hamilton, Ont., for two-story plant addition, 65 x 87 ft., to cost, with equipment, $75,000. Watt & Blackwell, London, are architects.

Canadian Car & Foundry Co., Ltd., 621 Craig Street West, Montreal, has awarded general contract to Foundation Co. of Canada, Ltd., 1538 Sherbrooke Street West, for addition to machine shop to cost $40,000. Spence, Mathias & Burge, 2063 Union Avenue, are architects.

William & J. G. Greey, Ltd., 56 Esplanade East, Toronto, Harold World, engineer, has let general contract to Graham & Sibbett, Ltd., 388 Yonge Street, for one-story machine shop, 66 x 188 ft. Cost about $70,000 with equipment.



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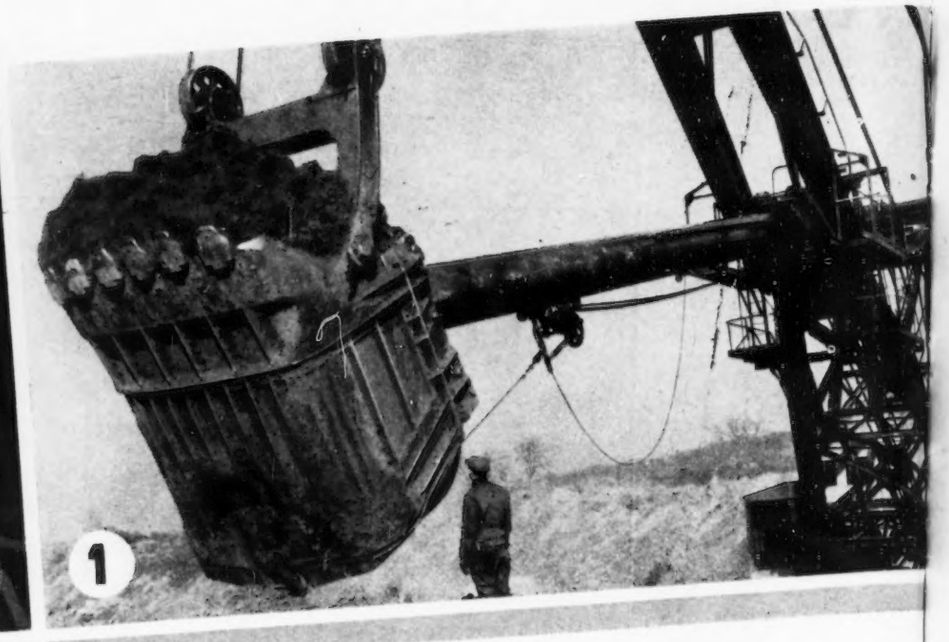

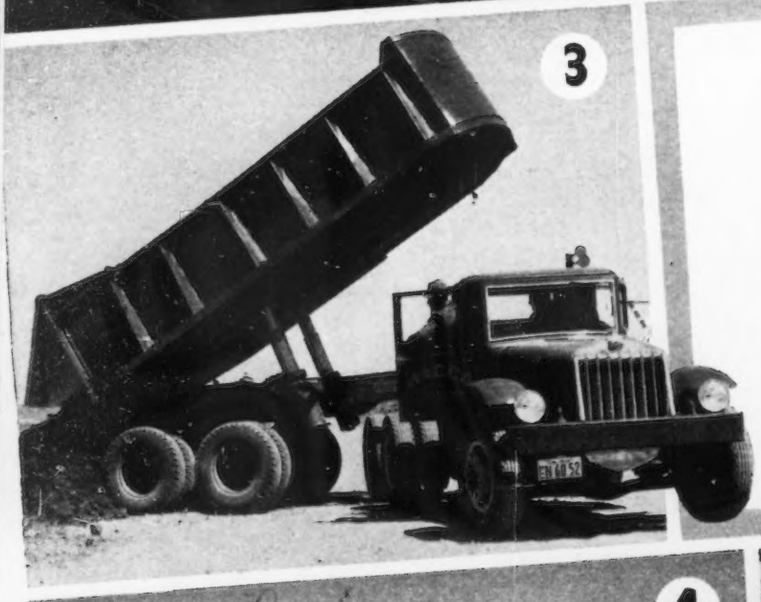

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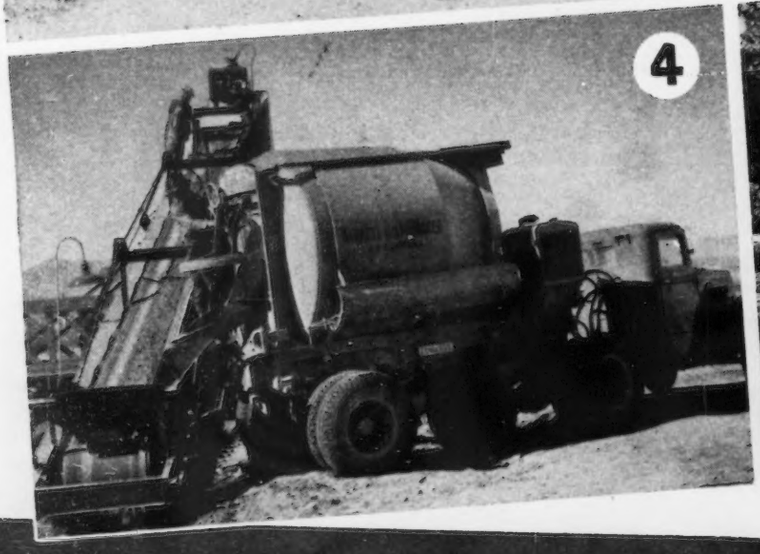

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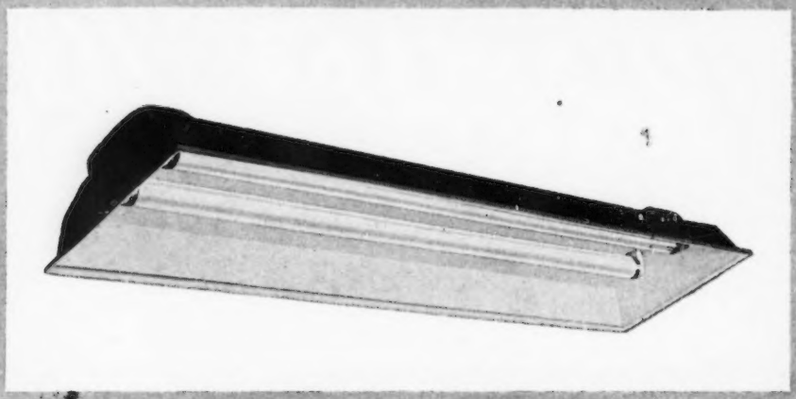

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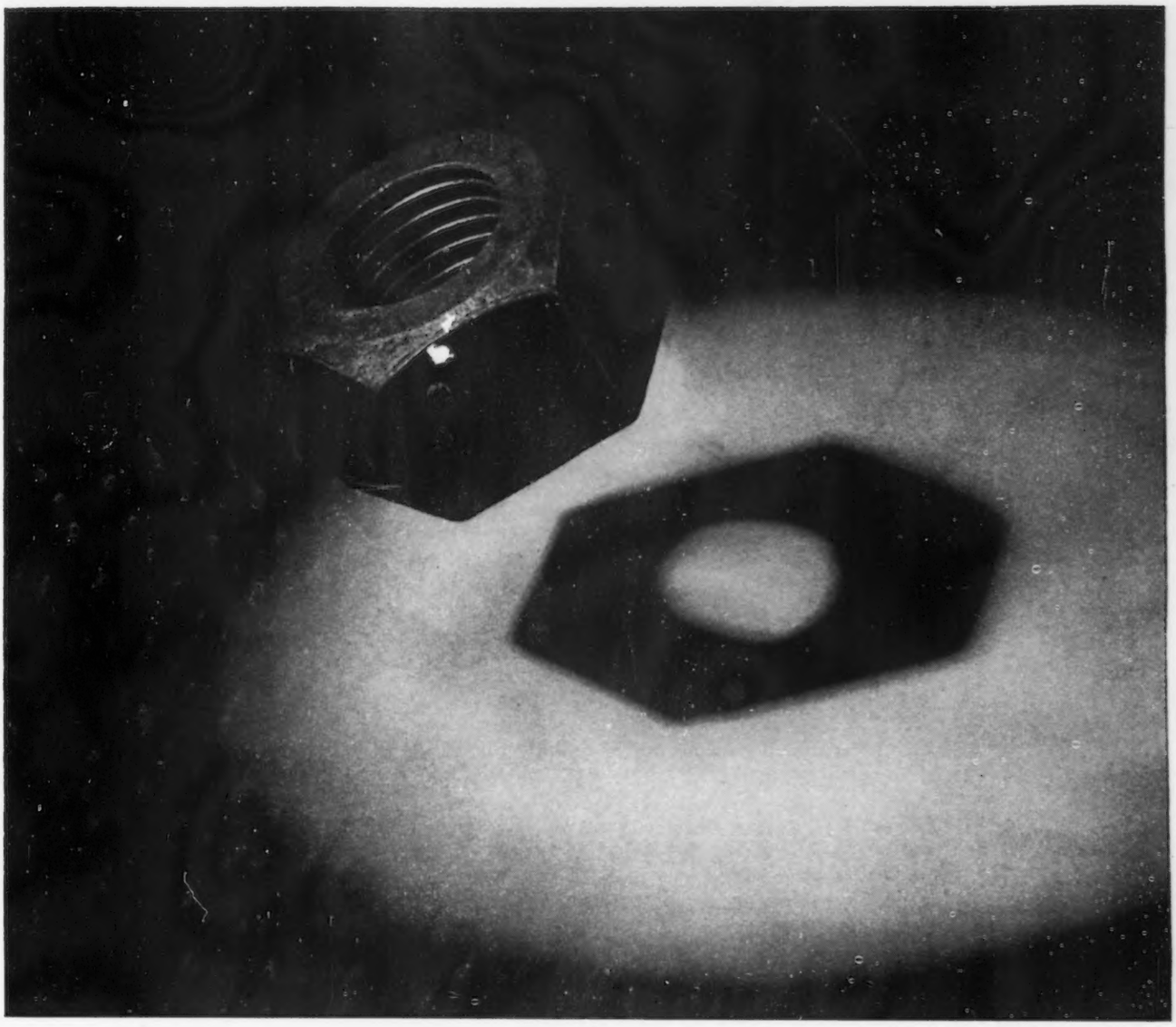
TUNE IN "MUSICAL AMERICANA," N. B. C. RED NETWORK, COAST-TO-COAST, EVERY THURSDAY EVENING.

Westinghouse Lighting Equipment



AN EXTRA-TOUGH NUT for extra-tough jobs!

Here's a common nut with threads free from cracks and strains, a nut that has greater resistance to splitting and to fatigue from excessive vibration.

How is it possible to make a common nut uncommon? By getting rid of the usual hole-punching process which tears the steel's grain structure. By using instead the Bethlehem Hot-Forging process.

This exclusive Bethlehem process forms the nut at forging temperature by working the plastic steel away from the center to the walls of the nut die. For this reason, the finished nut has a tougher, more sinewy grain structure. It has greater all-round strength and safety.

IMPORTANT: Though these Bethlehem nuts are made by an entirely different process, they are sold under the old trade names.

Hot-punched Actually Bethlehem Hot-Forged nuts in the "as rolled" state.

Cold-punched Hot-Forged and trimmed on the sides for a finish on the wrench surfaces.

Semi-finished Hot-Forged, trimmed, and accurately machined on the bearing surfaces.

FEATURES OF BETHLEHEM HOT-FORGED NUTS

Full-size threads are compacted, dense — free from cracks and strains.

Sidewall metal has more sinewy, fibrous grain structure, is uniformly sound.

Corners are well-filled, sharper, easier for wrench to grip.

Sides are denser, smoother. Oxidized surface offers greater resistance to corrosion.

Bearing surface is smoother, helps make a permanently tight job.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

We're just a Member of the Ground Crew

. . . *and we Like it!*

There's no glamour in tuning up the motors for someone else to fly. But it's necessary work.

There's no glamour in making springs that disappear into someone else's mechanisms. . . . But it's indispensable work, too!

All the years we have been treating springs as a vital part of industry's supply line now stand us in good stead. For it finds us adequately prepared to serve with:

- ✱ *A Production Line* for shipment of springs in large or small quantities to meet *your* production line requirements.
- ✱ *A Production Line* of heat-treating equipment, batch type and continuous, with carefully controlled atmospheres.
- ✱ *A Production Mill* producing unexcelled cold-rolled spring steel.
- ✱ Time-trained craftsmen...whose life calling is springmaking.

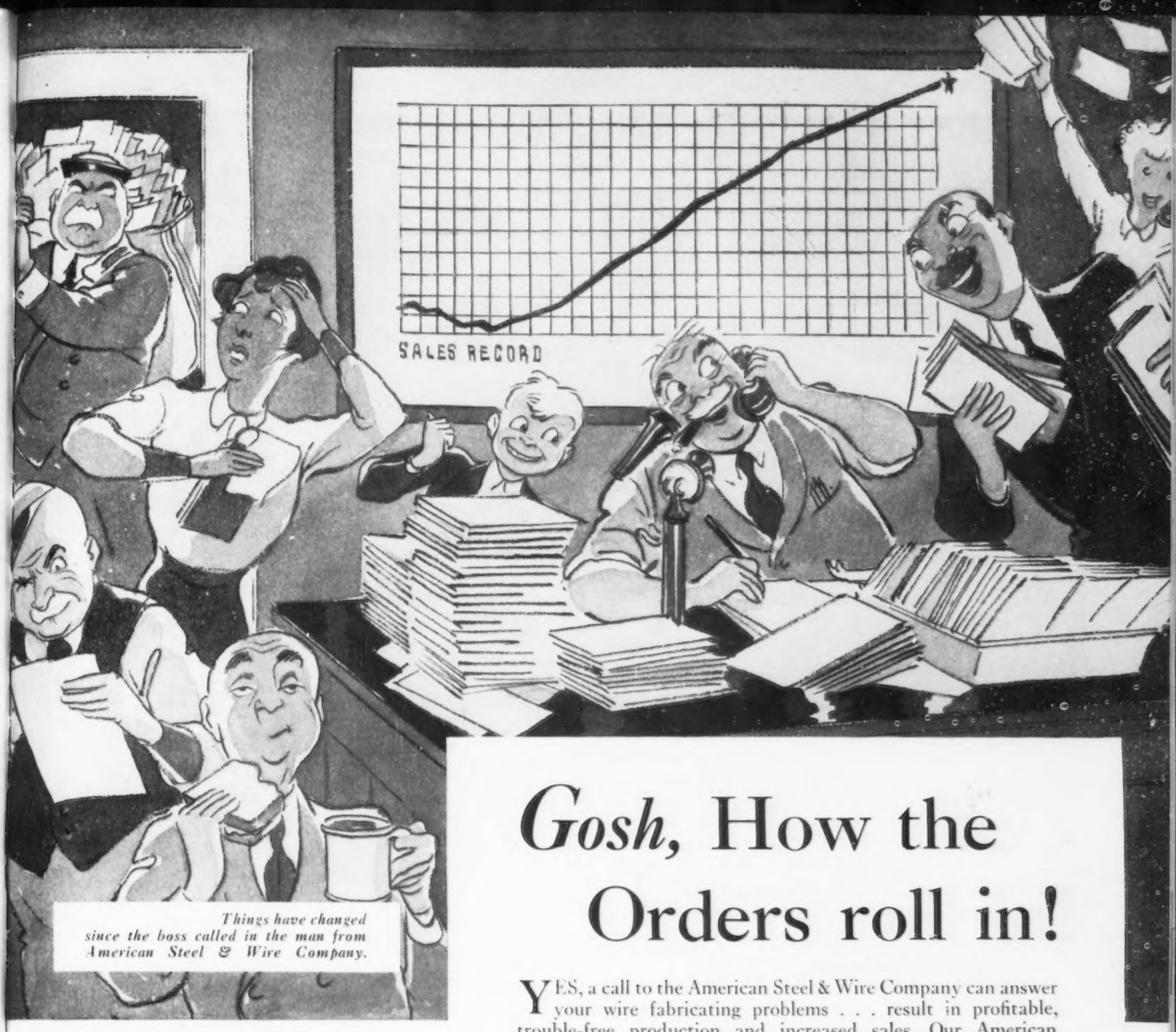
For American Products

Barnes-made Springs

and Spring Steel

WALLACE BARNES CO., BRISTOL, CONN., U.S.A.

DIVISION OF ASSOCIATED SPRING CORPORATION



Things have changed since the boss called in the man from American Steel & Wire Company.

Gosh, How the Orders roll in!

YES, a call to the American Steel & Wire Company can answer your wire fabricating problems . . . result in profitable, trouble-free production and increased sales. Our American Quality Wire has been meeting the needs of leading manufacturers for over a century. It can be supplied in a complete range of sizes, grades, shapes and analyses to meet the most exacting requirements. Our Sales and Techincal Departments are ready to assist you in determining the proper grade of American Quality Wire to meet your needs.

Premier Spring Wire · Weaving Wire · Pin Wire · Bolt, Rivet and Screw Wire · Broom and Brush Wire · Pinion Wire · Basic and Bessemer Screw Stock · Premier Tested Welding Wire · Flat Nut Stock · Hair Pin Wire · Mattress Wire · Music Spring Wire · Piano Wire · Amercut Cold Finished Steel Bars · Pump Rod Bars · Wool Wire · Wire Rods · Also U·S·S Stainless and Heat-Resisting Wires

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

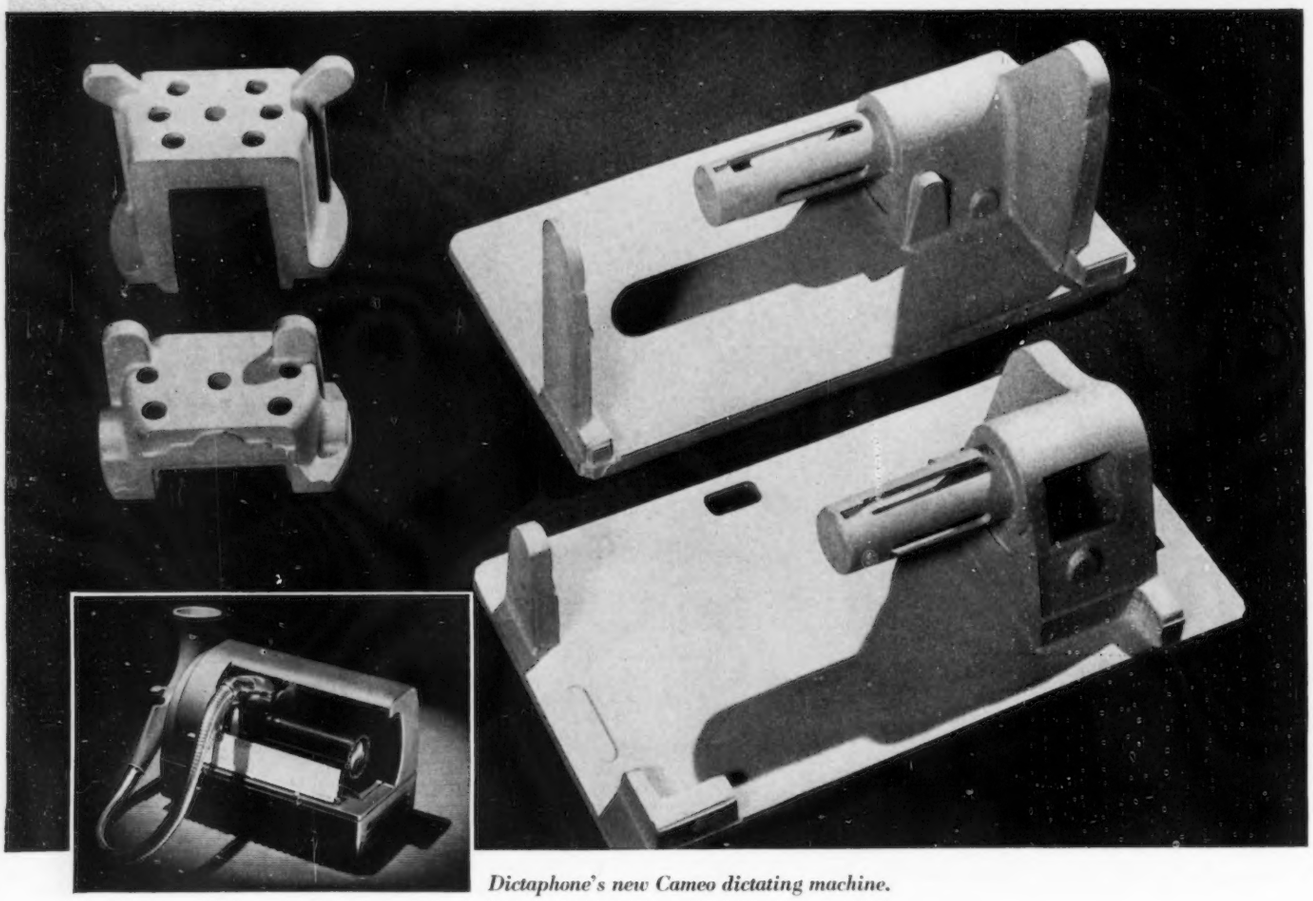
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

USS

AMERICAN *Quality* WIRES
FOR MANUFACTURING PURPOSES

UNITED STATES STEEL

SOMETHING FOR THE *Record*



Dictaphone's new Cameo dictating machine.

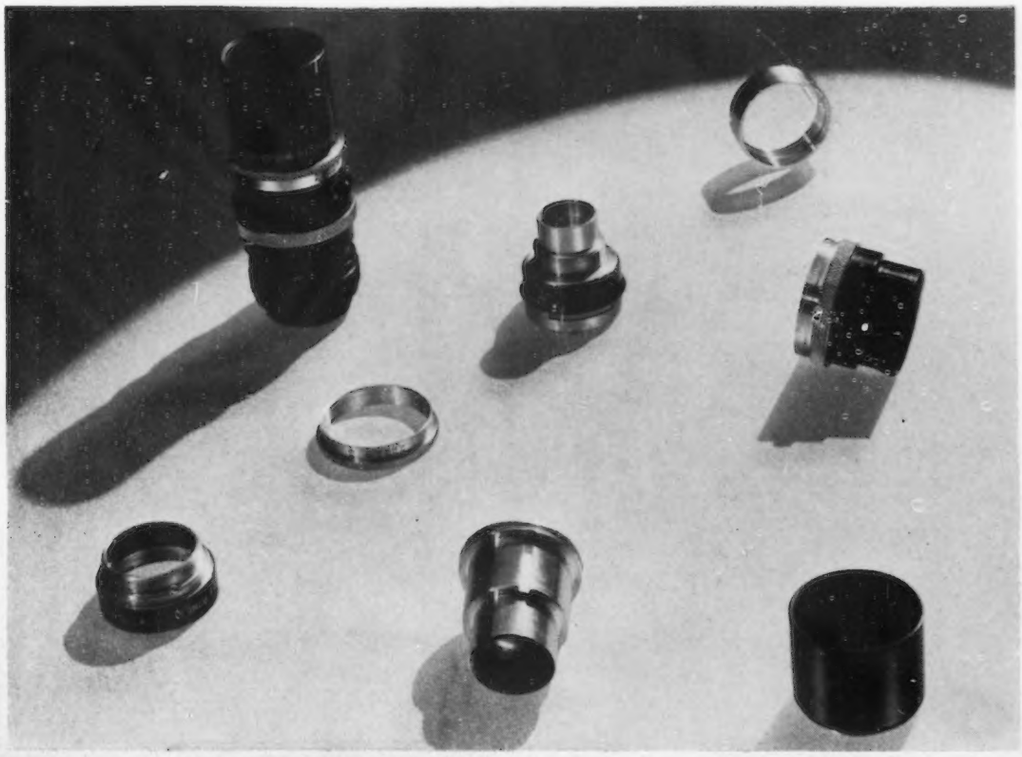
Dictaphone's dictating and transcribing machines first employed Aluminum sand castings to obtain compactness and light weight. Then, as production schedules called for larger quantities, the switch was made to Alcoa permanent-mold castings.

No changes in design were required. A few minor changes, however, enabled them to take advantage of the closer dimensional tolerances. And, within a year, the savings on machining and finishing thus obtained more than paid for the mold equipment.

It's easy to make the change to Alcoa Aluminum permanent-mold and semi-permanent-mold castings. You get high production at relatively low cost. You save on machining and finishing, because dimensional tolerances are close. The metal is sound and strong. Surfaces are smooth, taking a fine finish. ALUMINUM COMPANY OF AMERICA, 2185 Gulf Building, Pittsburgh, Penna.

IT IS NEVER COSTLY TO USE ALCOA ALUMINUM RIGHT

ALCOA ALUMINUM



THE LENS MAKER ASKED FOR

"light weight, precision and fine finish"

Alcoa Aluminum screw machine stock meets all requirements. That's why Wollensak Optical Company turned to this stock for making this 3-inch Cine Telephoto lens.

Aluminum reduces the over-all weight of the lens. This free-cutting stock machines at high speeds and takes a fine finish. There are no long curls to foul and dull tools, so dimensions are held to accurate limits and production schedules are maintained.

In comparing costs of screw machine products, remember that *with Aluminum* you get three times as many pieces per pound, compared with the heavy metals. Aluminum requires no expensive plated coatings, but it can be given a great variety of attractive, durable finishes.

ALUMINUM COMPANY OF AMERICA, 2185 Gulf Building, Pittsburgh, Pennsylvania.

IT IS THRIFTY TO USE ALCOA ALUMINUM WISELY

ALCOA ALUMINUM

Customers Say..
"CLE-FORGE HIGH SPEED DRILLS PRODUCE MOST HOLES PER GRIND, MOST GRINDS PER DRILL"
Are You Drilling Small Holes in Crankshafts... or Big Ones in Bedplates?

You scarcely could name a more exacting job than the *multiple* drilling of oil holes in nickel-steel crankshafts.

Nor, by contrast, a simpler one than drilling bedplates, frames, etc., of grey iron through accurately-spaced fixtures.

Yet, on a moment's notice, The Cleveland Twist Drill Company can supply Tools to work successfully not only these two extremes, but any other material that *can be* drilled—ferrous or non-ferrous metals, fiber, or plastics.

This Company's resourcefulness in supplying Drills and Reamers, correctly formulated to meet your exact drilling requirements, and to measurably reduce your drilling costs, is based upon long years of continuous research by capable Engineers in Metallurgy, Design and Application Research.

Their experience is fully at your call on any Drilling problem—they will join you in analyzing drilling operations in your own Plant, and will make practical suggestions, without obligating you. Telephone a "Cleveland" Stockroom or your usual source of supply.

We favor adequate Preparedness for National Defense

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD. DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

"3C" BULLETIN 100 TYPE "D" HEAVY DUTY PUSH BUTTONS OIL IMMERSED FOR CLASS 1, GROUP D, HAZARDOUS LOCATIONS

Closed View—Showing Sturdy Construction and Rounded Corners for Easy Operation and Avoidance of Skinned Knuckles

THE latest addition to the "3C" line of Type "D" Heavy Duty Push Buttons, an oil immersed station, features the same sturdy mechanism used in preceding Type D Buttons. These Push Buttons are built in accordance with Underwriters' specifications for Class 1, Group D, Hazardous Locations, with or without oil. The addition of oil eliminates the action of corrosive gas, and smothers any arc generated at the contacts.

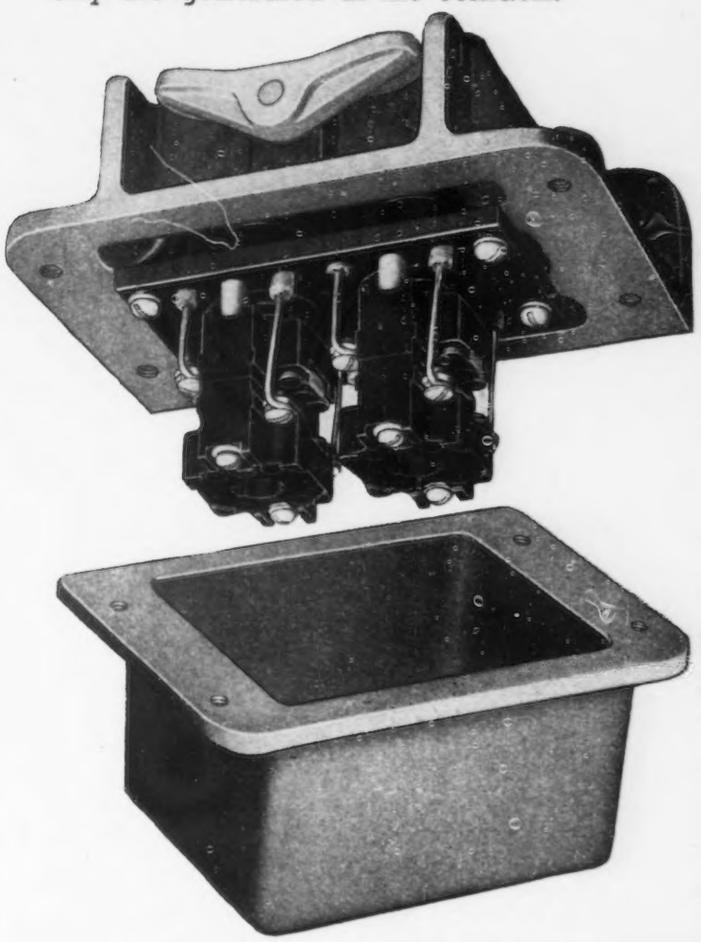
The case consists of a heavy cast iron upper section, to which are attached the Push Button units, and a cast iron oil tank, both with wide, accurately machined flanges, thus completely assuring the cooling of any flame which may be started by explosion in the enclosure.

Provision is also made for locking in the "OFF" or "STOP" position.

Each Push Button unit has a Normally Open and a Normally Closed Contact supplied as standard. Maintained Contact Push Buttons are also available.

The Push Button units are mounted on an easily removable insulating subbase, which also acts as a wire spacer.

Our nearest office or agency will gladly give you further details.



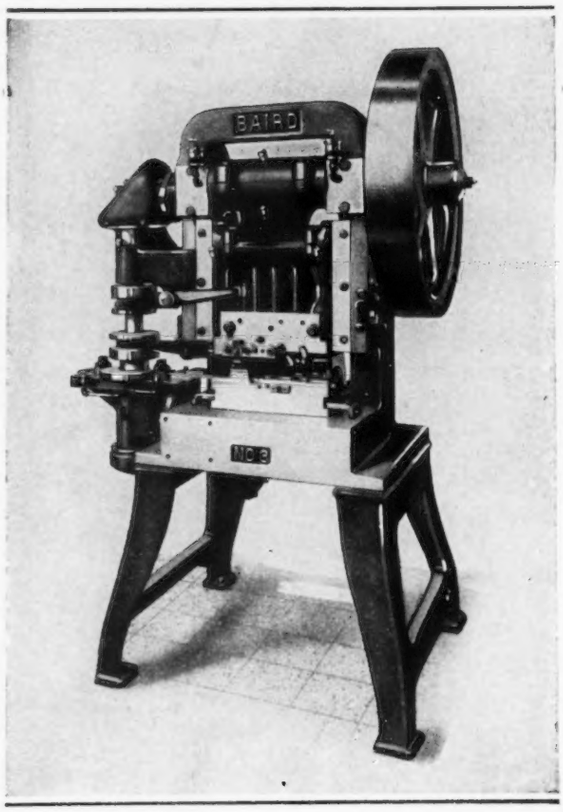
Open View—Note Wide, Accurately Machined Flanges and Full Capacity Oil Tank

CONTINUE TO ROLL WITH CLARK CONTROL

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

HIGH PRODUCTION PRESSES BY BAIRD



A BAIRD MULTIPLE TRANSFER PRESS

ADVANTAGES ON PRODUCTION JOBS

Least down time for press because punch and die sets are quickly interchangeable.

Punches are individually adjustable, therefore are each adjusted only as needed.

There is no adjustment in the press itself therefore no time lost making and correcting unnecessary adjustments.

THE DOWN TIME for the tool set-up shown in the picture when interchanging to a similar set-up WAS 4 MINUTES.

PRESSES MAY BE HAD WITH

Slide or roll feeds as may best suit a job.

Shaft for tool slide and shaft for transfer slide are provided to give strokes to give highest operating speed for the job.

If desired, other feed mechanism and other shafts may be used to best suit a new job.

Presses have been supplied with special feeds to handle special material.

The number of transfer positions is determined by the job.

There are a number of different sizes of presses.

"Ask Baird About It"

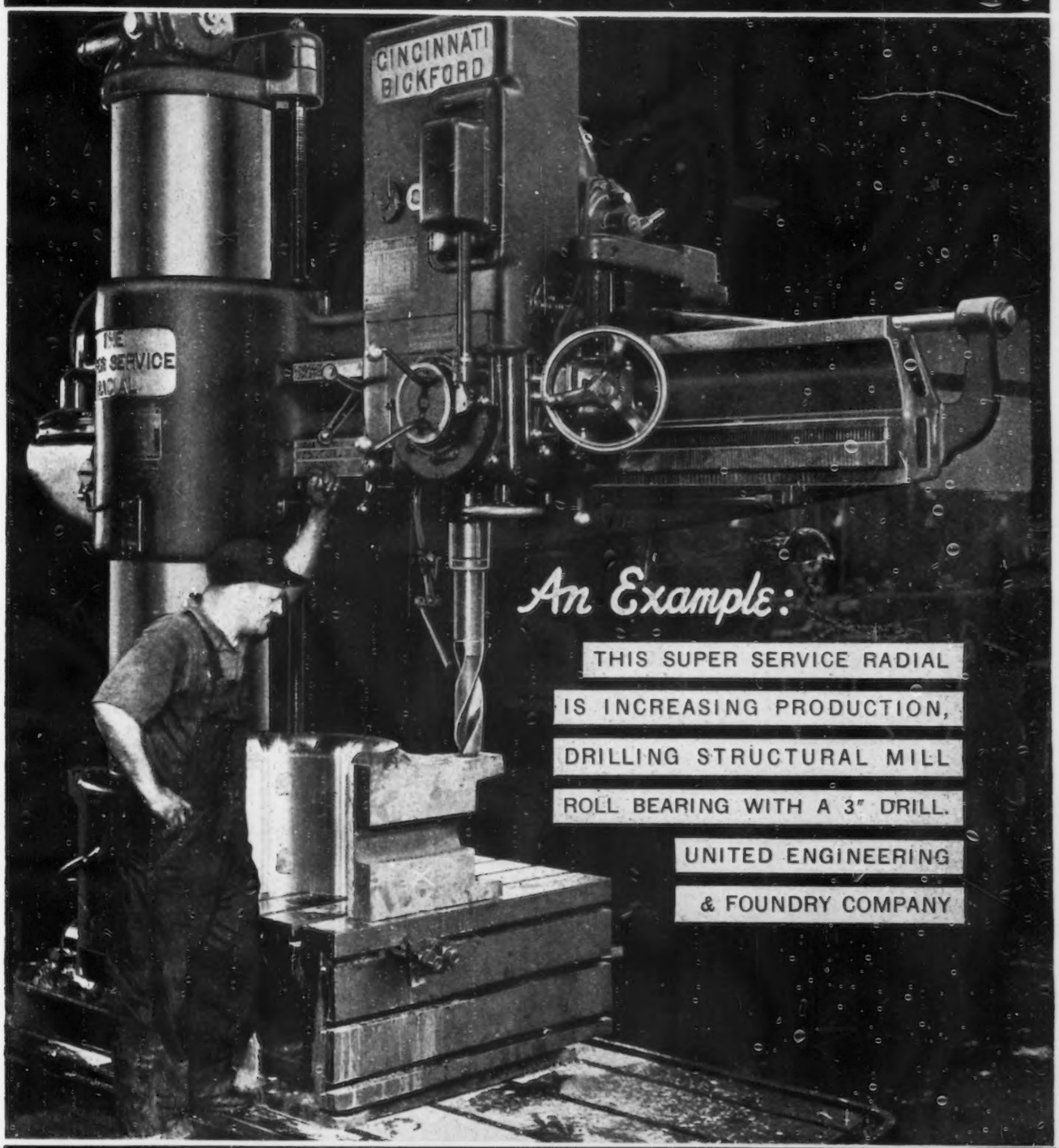
THE BAIRD MACHINE CO.

BRIDGEPORT, CONN.

Since 1849 High Production Machines For Articles of Wire and Ribbon Metal

Throughout Industry...

THIS SUPER C B SERVICE TRADEMARK MEANS "MORE HOLES PER DOLLAR"!

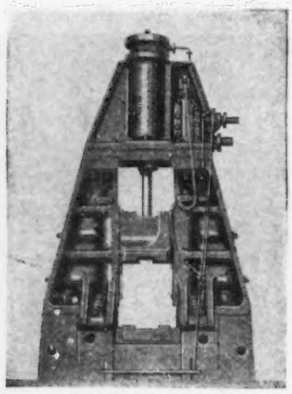


THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

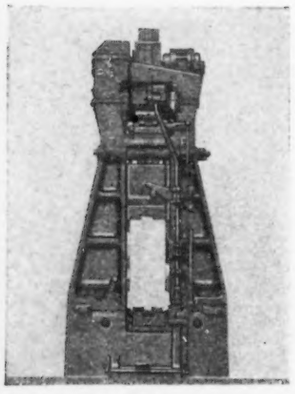
First— come Forgings — for Defense

TO the peaceful activities of industrial production, the Chambersburg Hammers of America's great forge shops are now adding the tremendous burdens of defense preparation. For first in the production of the vital parts of battleships, cruisers, torpedo boats, submarines, airplanes, tanks, combat cars, artillery and all the other essentials of modern mechanized warfare, come the forgings — combining utmost strength, with relatively low weight. The same skill and experience that made Chambersburg's contribution to peacetime mechanization so valuable is now being devoted with increased intensity to defense.



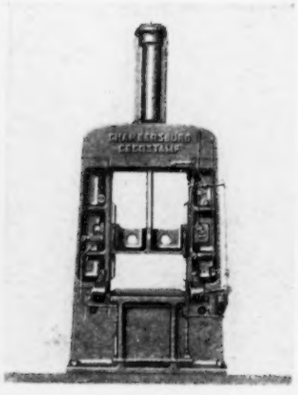
STEAM DROP HAMMERS

Standard of the industry. Greater production, greater steam or air economy, and greater accuracy. The Chambersburg patented Side Valve is featured.



BOARD DROP HAMMERS

Frame-to-anvil construction, front rod design, simplicity of motor drive, and increased board life characterize this efficient Board Drop Hammer.



CECOSTAMP

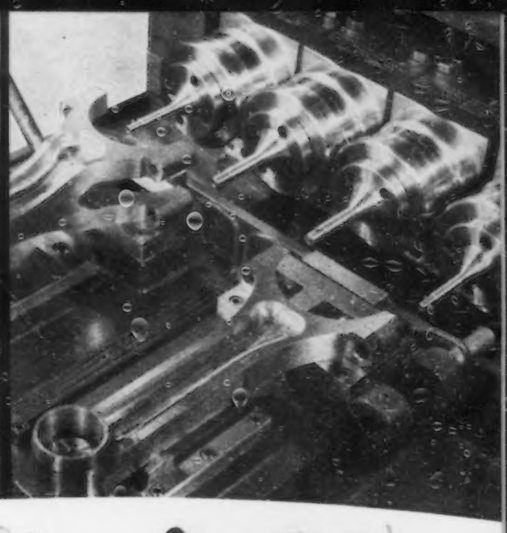
Modern drop stamp for forming light weight, high strength sheet metal parts, and for small-quantity short-run work.

CHAMBERSBURG ENGINEERING CO.
CHAMBERSBURG . . . . . PENNA.

SINCE-1897

CHAMBERSBURG

HAMMERS • PRESSES CECOSTAMPS



Ex-Cell-O Boring
precision m
clos

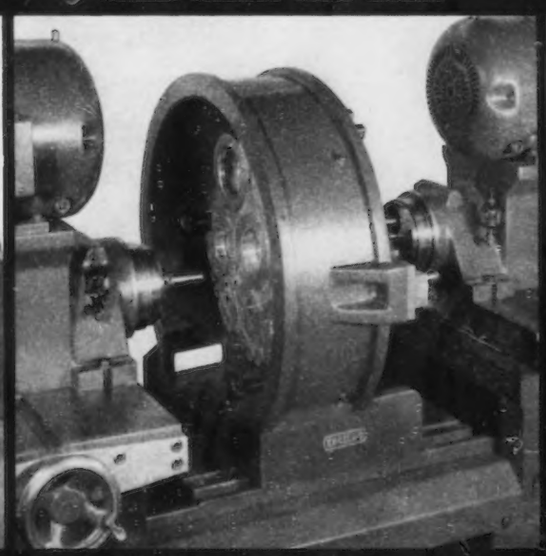
Precision . . . COMES INTO ITS OWN!

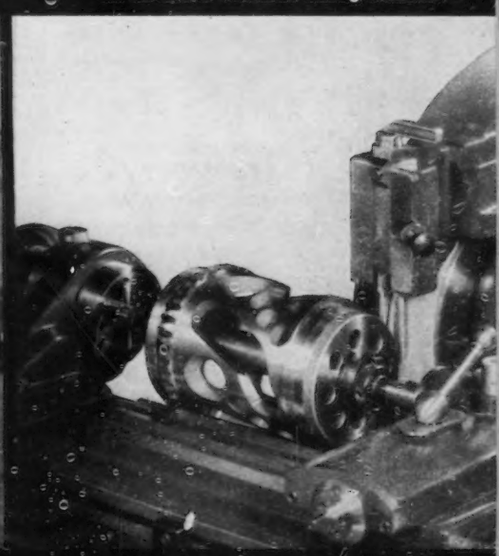
IN a practical way, an Ex-Cell-O Precision Machine represents a basic requirement of modern industry—*extreme accuracy in measurement.* Without exceedingly fine measurements—as available with every Ex-Cell-O machine—and the interchangeability of parts that such precision allows, today's mass production of manufactured products would be impossible . . . the vital high production speed on which the success of our nation's defense program now depends could not possibly be attained. Ex-Cell-O is a pioneer in constantly developing higher standards of precision performance with machine tools. This is why today—in quantity production of vital parts for airplanes, automobiles, tractors, and almost every other major product requiring metal parts held to closest possible limits—Ex-Cell-O Precision Machines and Tools are being widely used in all the important industries. If your problem is one that involves the making of precision metal parts on a high-speed, economical basis, you will find it well worth-while to consult Ex-Cell-O.

EX-CELL-O CORPORATION · 1228 OAKMAN BLVD. · DETROIT, MICH.

irplane studs being ground from the solid on battery of Ex-Cell-O Style 33 Precision Automatic Thread Grinders.

Turning and chamfering aluminum piston for liquid cooled aircraft engine on an Ex-Cell-O Precision Boring Machine.





Style 1212 Precision Boring Machine finish boring holes in aluminum piston assembly for hydromatic propellers.

Ex-Cell-O Machine rough and finish boring, chamfering and facing magnesium alloy rear case for aircraft engine.

A 12 pitch thread being ground from the solid on rotating propeller cam on 31 Ex-Cell-O Precision Thread Grinder.

EX-CELL-O (XLO) *Precision* **MACHINES AND TOOLS**

EX-CELL-O CORPORATION
1210 Oakman Blvd., Detroit, Michigan

Please send bulletins on Thread Grinding and Precision Boring.

Name_____ Title_____

Company_____

Address_____

Products Index

WHO MAKES IT

Here you find a weekly listing of hundreds of products with the names and addresses of manufacturers. The advertisements of these companies appear in The Iron Age.

ABRASIVE CLOTH & PAPER
Carborundum Co., The Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

ABRASIVE GRAIN
Carborundum Co., The Niagara Falls, N. Y.

ABRASIVE WHEELS — See Grinding Wheels

ABRASIVES—Steel Shot and Grit
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Harrison Abrasive Corp., Manchester, N. H.
Pangborn Corporation, Hagerstown, Md.
Pittsburgh (Pa.) Crushed Steel Co.
Steel Shot & Grit Co., Boston, Mass.

ACCESSORIES—Welding
Lincoln Electric Co., The, Cleveland.

ACCUMULATORS—Hydraulic
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia, Pa.

ACETYLENE—Dissolved in Cylinders & Small Tanks
Air Reduction, 60 East 42nd St., N.Y.C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

ACID-PROOF CEMENT
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Sauereisen Cements Co., Pittsburgh, Pa.

ACIDS—Pickling
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

AIR CONDITIONING EQUIPMENT
American Blower Corp., 6000 Russell St., Detroit, Mich.

ALLOYS—Copper
American Brass Co., The, Waterbury, Conn.
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

ALLOYS—Corrosion & Abrasion Resistant
Wall-Colmonoy Corp., Detroit, Mich.

ALLOYS—Ferro
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

ALLOYS—Magnesium
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

ALLOYS—Zinc For Die Castings
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

ALUMINUM
Aluminum Co. of America, Pittsburgh.

AMMETERS & VOLTMETERS
General Electric Co., Schenectady, N. Y.

AMMETERS AND VOLTMETERS—Recording
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

AMMONIA RECOVERY PLANTS
Koppers Co., Engineering & Construction Div., Pittsburgh.

ANGLES, BEAMS, CHANNELS AND TEES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp Subsidiary), San Francisco, Calif.
Holliday, W. J., & Co., Hammond, Ind.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

ANGLES, BEAMS, CHANNELS & TEES —Magnesium Alloys
Dow Chemical Co., The 921 Jefferson Ave., Midland, Mich.

ANNEALING—See Heat Treating

ANNEALING BOXES
Lebanon (Pa.) Steel Foundry.
United Engineering & Fdry. Co., Pitgh.

ANODES—Lead
National Lead Co., 111 Bdway., N. Y. C.

APPAREL—Welding
Lincoln Electric Co., The, Cleveland.

ARBORS
Cincinnati (Ohio) Milling Mch. Co., The.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

ARRESTERS—Spark
Harrington & King Perforating Co., The, Chicago.

ASBESTOS
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St., N. Y. C.

AXLES—Car or Locomotive
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

BABBITT METALS
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Cramp Brass & Iron Foundries Co., Philadelphia.
National Lead Co., 111 Bdway., N. Y. C.
Ryerson, Jos. T., & Son, Inc., Chicago, Ill.

BALANCING MACHINES — Static Dynamic
Gisholt Machine Co., Madison, Wis.

BALING PRESSES—Scrap — See Presses —Baling

BALLS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Hartford (Conn.) Steel Ball Co., The.

BALLS—Steel, Brass or Bronze
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Fafnir Bearing Co., The, New Britain, Conn.
Hartford (Conn.) Steel Ball Co., The.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.

BANDS—Steel
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BARRELS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.

BARRELS—Tumbling
Baird Mch. Co., The, Bridgeport, Conn.
Hartford (Conn.) Steel Ball Co., The.
Whiting Corp., Harvey, Ill.

BARS—Alloy
Copperweld Steel Co., Warren, Ohio.
Midvale Co., The, Nicetown, Phila., Pa.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago, Ill.

BARS—Aluminum
Aluminum Co. of America, Pittsburgh.

BARS—Brass, Bronze or Copper
Bunting Brass & Bronze Co., Toledo, Ohio.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.

BARS—Cold Drawn
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Holliday, W. J., & Co., Hammond, Ind.
Jones & Laughlin Steel Corp., Pittsburgh,
Monarch Steel Co., Indianapolis, Ind.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

BARS—Concrete, Reinforcing
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Jones & Laughlin Steel Corp., Pittsburgh.
Laclede Steel Co., St. Louis, Mo.
Nicetown Plate Washer Co., Inc., Philadelphia.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BARS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

BARS—Rustless
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.

BARS—Steel
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Copperweld Steel Co., Warren, Ohio.
Great Lakes Steel Corp., Ecorse, Detroit
Holliday, W. J., & Co., Hammond, Ind.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Wisconsin Steel Co., Chicago, Ill.
Youngstown (Ohio) Sheet & Tube Co., The

BATTERIES—Storage
Electric Storage Battery Co., The, Phila.
Philco, Battery Div., Phila., Pa.

BATTERY CHARGERS
Cutler-Hammer, Inc., Milwaukee.

BEAMS—See Angles, Beams, Channels and Tees

BEARINGS—Babbitt
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.

BEARINGS—Ball
Bantam Bearings Corp., The, South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Fafnir Bearing Co., The, New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., Poughkeepsie, N. Y.

BEARINGS, Brass and Bronze
Ampco Metal, Inc., Milwaukee, Wis.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.

BEARINGS—Oilless
Bunting Brass & Bronze Co., Toledo, O.
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago, Ill.

BEARINGS—Quill
Bantam Bearings Corp., The, South Bend, Ind.

BEARINGS—Radial
Bantam Bearings Corp., The, South Bend, Ind.
Bower Roller Bearing Co., Detroit, Mich.
Fafnir Bearing Co., The, New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

BEARINGS—Roll Neck
Bantam Bearings Corp., The, South Bend, Ind.
Morgan Construction Co., Worcester, Mass.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Roller
Bantam Bearings Corp., The, South Bend, Ind.
Bower Roller Bearing Co., Detroit, Mich.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
Link-Belt Co., 519 North Holmes Ave. Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Roller Tapered
Bantam Bearings Corp., The, South Bend, Ind.
Bower Roller Bearing Co., Detroit, Mich.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Rolling Mill Equipment
Bantam Bearings Corp., The, South Bend, Ind.
Morgan Construction Co., Worcester, Mass.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Shaft Hanger
Fafnir Bearing Co., The, New Britain, Conn.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.

BEARINGS—Thrust
Bantam Bearings Corp., The, South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Fafnir Bearing Co., The, New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Timken Roller Bearing Co., The, Canton, O.

BELT—Conveyor, Elevator
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

BELTING—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

BELTING—Metal, Conveyor, High and Low Temperature
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

BELTING—Rubber
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

BELTS—V-Type
Allis-Chalmers Mfg. Co., Milwaukee.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

BENCH LEGS—Steel
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

BENCH PLATES
Challenge Machinery Co., Grand Haven, Mich.

BENDING—Pipe and Tube
Swan Engineering Co., Inc., Newark, N. J.

BENDING MACHINES—Hand, Band and Angle
Excelsior Tool & Mch. Co., E. St. Louis, Ill.

BENDING MACHINES—Hand and Power
Buffalo (N. Y.) Forge Co., 492 Broadway.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co. The, Steelweld Mchry. Div., Wickliffe, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.
Niagara Machine & Tool Works, Buffalo, N. Y.

BENZOL RECOVERY PLANTS
Koppers Co., Engineering & Construction Div., Pittsburgh.

BERYLLIUM COPPER
American Brass Co., The, Waterbury, Conn.

BILLETS—Alloy
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.

BILLETS—Alloy Steel
Andrews Steel Co., The, Newport, Ky.
Copperweld Steel Co., Warren, Ohio.

BILLETS—Carbon
Harrisburg (Pa.) Steel Corp.

BILLETS—Carbon Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Chrome Nickel Steel
Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Chrome Steel
Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Forging
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Harrisburg (Pa.) Steel Corp.
Republic Steel Corp., Cleveland, Ohio.

BILLETS—Re-rolling
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.

BILLETS—Re-rolling Facilities
Nicetown Plate Washer Co., Inc., Philadelphia, Pa.

BILLETS—Steel
Bethlehem (Pa.) Steel Company.
Continental Steel Corp., Kokomo, Ind.
Copperweld Steel Co., Warren, Ohio.

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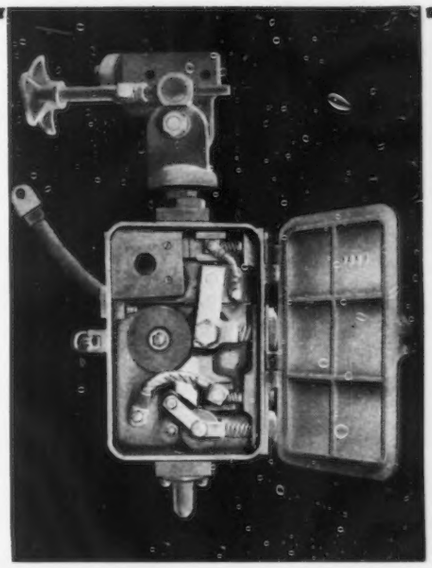

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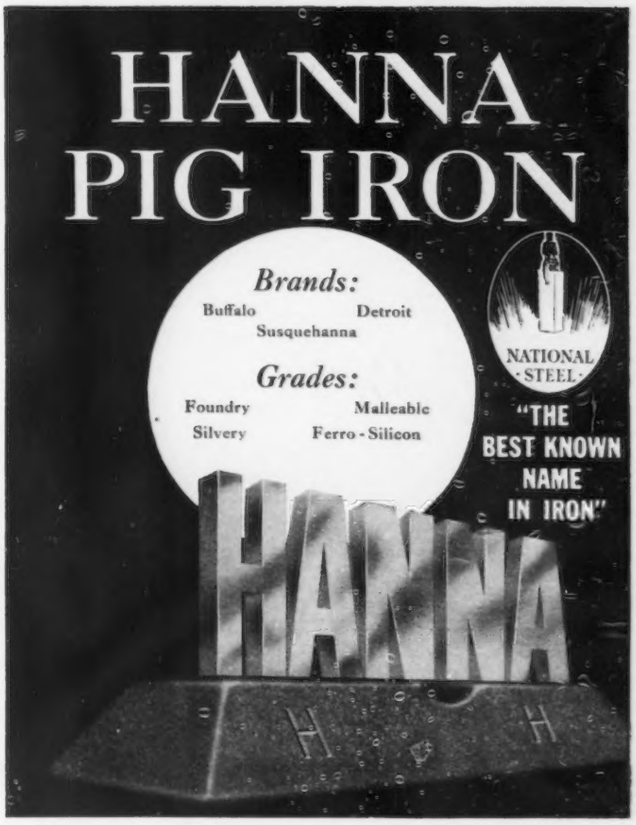

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MERCHANT PIG IRON DIVISION
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Products Index

Jones & Laughlin Steel Corp., Pittsburgh.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Wisconsin Steel Co., Chicago, Ill.

BLANKS—Chisel
Cleveland (Ohio) Punch & Shear Works Co., The.
Cleveland Steel Tool Co., The, 660 E. 82nd St., Cleveland, Ohio.

BLANKS—Gear and Pinion
Chicago (Ill.) Rawhide Mfg. Co., **The,** 1306 Elston Ave.

BLAST CLEANING EQUIPMENT
American Foundry Equipment Co., **The,** 510 S. Byrkit St., **Mishawaka, Ind.**
Pangborn Corporation, Hagerstown, Md.

BLAST FURNACE PLANTS—Complete
Brassert, H. A., & Co., Pittsburgh, Pa.
McKee, Arthur G., & Co., Cleve and.

BLAST FURNACE SPECIALTIES
Bailey, Wm. M., Co., Pittsburgh, Pa.
McKee, Arthur G., & Co., Cleveland.

BLAST GATES
Rockwell, W. S., Co., 50 Church St.,**N.Y.C.**

BLOCKS—Chain
Yale & Towne **Mfg. Co., The, Phila. Div.,** Phila., Pa.

BLOWERS
American Blower Corp., 6000 Russell St., Detroit, Mich.

BLOWERS—Blast Furnace
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

BLOWERS—Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

BLOWERS—Cupola
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

BLOWERS—Rotary & Centrifugal
Roots-Connersville Blower Corp., Connersville, Ind.

BLOWPIPES—Oxy-Acetylene Welding & Cutting
Linde Air Products Company, The, 30 East 42nd St., **N. Y. C.**
Weldit Acetylene Co., Detroit, Mich.

BLOWPIPES — Soldering, Heating, Annealing
American Gas Furnace Co., Elizabeth, N. J.
Weldit Acetylene Co., Detroit, Mich.

BOILERS—Waste Heat
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BOILERS—Water Tube
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BOLT CUTTERS
Landis Mch. Co., Inc., Waynesboro, Pa.

BOLT AND NUT MACHINERY
Ajax Mfg. Co., The, Cleveland, Ohio.
Hill Acme Co., The, Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Waterbury (Ct.) Farrel Fdry. & Mch Co., The.

BOLT & RIVET CLIPPERS
Helwig Mfg. Co., St. Paul, Minn.

BOLTS—Carriage and Machine
Bethlehem (Pa.) Steel Company.
Cleveland (Ohio) Cap Screw Co., The.
Erie (Pa.) **Bolt & Nut Co.**
Lamson & Sessions Co., The, **Cleveland.**
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Triplex Screw Co., **Cleveland.**

BOLTS—Special
Cleveland (Ohio) Cap Screw Co., The.
Erie (Pa.) **Bolt & Nut Co.**
Lamson & Sessions Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Special, Hot or Cold Upset
Lamson & Sessions Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Stove
Lamson & Sessions Co., **The, Cleveland.**
Progressive Mfg. Co., Torrington, Conn.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Stove, Recessed Head
American Screw Co., **Providence, R. I.**

BOLTS—Track
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

BOLTS AND NUTS
American Screw Co., **Providence, R. I.**
Bethlehem (Pa.) Steel Company.
Clark Bros. Bolt Co., Millidale, Conn.
Cleveland (Ohio) Cap Screw Co., The.
Erie (Pa.) **Bolt & Nut Co.**
Lamson & Sessions Co., The, Cleveland.
Republic Steel Corp., Cleveland, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Triplex Screw Co., Cleveland.

BOLTS AND NUTS—Self Locking
Lamson & Sessions Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BORING BARS
Bullard Co., The, Bridgeport, Conn.
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Gairing Tool Co., The, Detroit.
Gisholt Machine Co., Madison, Wisconsin.

BORING, DRILLING & MILLING MACHINES—Horizontal
Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
Lucas Machine Tool Co., Cleveland
Ohio Machine Tool Co., Kenton, Ohio.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

BORING & DRILLING MACHINES—Vertical
Bullard Co., The, Bridgeport, Conn.
Consolidated Machine Tool Corp., Rochester, N. Y.

BORING MACHINES—Diamond & Carbide Tools
Heald Machine Co., Worcester, Mass.

BORING MACHINES—Jig
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

BORING MACHINES—Precision
Cimatool Co., The, Dayton, Ohio.
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

BORING & TURNING MILLS—Vertical
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Planer Co.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

BRACES—Bit
North Bros. Mfg. Co., Philadelphia, Pa.

BRAKE LINING & BLOCKS—Asbestos
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

BRAKES—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

BRAKES—Electric & Mechanical
Clark Controller Co., The, Cleveland.
Electric Controller & Mfg. Co., The, Cleveland.

BRAKES—Magnetic
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

BRAKES—Metal Forming
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co., The Steelweld Machinery Div., Wickliffe, Ohio.
Dreis & Krump Mfg. Co., Chicago.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

BRAZING—Electric
Metal Electric Processing Co., The, Toledo, Ohio.

BREAKERS—Electric Circuit
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

BRICK—Acid Proof
Sauereisen Cements Co., Pittsburgh, Pa.

BRICK—Fire Clay
Illinois Clay Products Co., Joliet, Ill.

BRICK—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.
Carborundum Co., The Perth Amboy, N. J.

BRICK-REFRACTORY
Carborundum Co., The Perth Amboy, N. J.

BRIDGE BUILDERS
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Belmont Iron Works, Philadelphia.

BRIDGE OPERATING MACHINERY—Movable
Earle Gear & Mch. Co., **Philadelphia.**

BRIQUETS—Ferroalloy
Electro Metallurgical Sales Corp., **30 East** 42nd St., N. Y. C.

BROACHES
Colonial Broach Co., Detroit.
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Milling Mch. Co., **The.**
Colonial Broach Co., Detroit.
Lucas Machine Tool Co., Cleveland.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

BRONZE FOR DIES
Ampco Metal, Inc., Milwaukee, **Wis.**

BRONZE—Phosphor
Bunting Brass & Bronze Co., Toledo, **Ohio.**
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

BRUSHES—Industrial
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BRUSHES—Machine
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BRUSHES—Paint
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BRUSHES—Wire
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BUCKETS—Clamshell
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Hayward Co., The, 50 Church St.,N. Y. C.
Heyl & Patterson, Inc., Pittsburgh.
Industrial Brownhoist Corp., **Bay City,** Mich.
Wellman Engineering Co., The, **Cleveland**

BUCKETS—Electric Motor
Hayward Co., The, 50 Church St.,N. Y. C.

BUCKETS—Elevator
Jeffrey Mfg. Co., The, Columbus, Ohio.

BUCKETS—Orange Peel
Hayward Co., The, 50 Church St.,N. Y. C.

BUILDINGS—Steel
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
American Rolling Mill Co., The, Middletown, Ohio.
Belmont Iron Works, Philadelphia.
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
Iron & Steel Products, Inc., Chicago.

BULLDOZERS
Ajax Mfg. Co., The, Cleveland, Ohio.
Cleveland Crane & Engineering Co., The Steelweld Machinery Div., Wickliffe, Ohio.

BURNERS—Oil or Gas
American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

BURNISHING MACHINES—Gear
Cimatool Co., The, Dayton, Ohio.

BURRING MACHINES
Cimatool Co., The, Dayton, Ohio.
National Broach & Machine Co., Detroit, Mich.

BUSHINGS—Bronze
Ampco Metal, Inc., Milwaukee, Wis.
Bunting Brass & Bronze Co., Toledo, O
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, Ohio.

BUSHINGS—Drill Jig
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

BUSHINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BUSHINGS—Phosphor Bronze
Bunting Brass & Bronze Co., Toledo, Ohio.

BY-PRODUCTS COKE AND GAS PLANTS
Koppers Co., Engineering & Construction Div., Pittsburgh.

CABLE—Electric
General Electric Co., Schenectady, N. Y
Lincoln Electric Co., The, Cleveland.

CABLEWAYS AND TRAMWAYS—See Tramways

CALCIUM METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

CAMS
Hartford (Conn.) Special Machinery Co., The.

CARBIC
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

CARBIDE
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

CARBIDE—Boron
Norton Co., Worcester, Mass.

CARBIDES—Cemented
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.

CARBURIZING BOXES
Electro Alloys Co., Elyria, Ohio.

CARBURIZING—See Heat Treating

CARS—Industrial and Mining
Heyl & Patterson, Inc., Pittsburgh.

CARS—Railway
Iron & Steel Products, Inc., Chicago.

CASE HARDENING—See Heat Treating

CASTERS
Darnell Corp., Ltd., Long Beach, Calif

CASTINGS—Acid or Heat Resisting
Ampco Metal, Inc., Milwaukee, Wis.
Cramp Brass & Iron Foundries Co., Philadelphia.
Duraloy Co., The, Scottdale, Pa.
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.
Electro Alloys Co., Elyria, Ohio.
Hoskins Mfg. Co., Detroit, Mich.
Lebanon (Pa.) Steel Foundry.
Meehanite Research Institute, Pittsburgh, Pa.
Ohio Steel Foundry Co., Lima, Ohio.

CASTINGS—Alloy Iron
Cramp Brass & Iron Foundries Co., Philadelphia.

CASTINGS—Alloy Steel
Advance Foundry Co., The, Dayton, Ohio.
Electro Alloys Co., Elyria, Ohio.
Hartford (Conn.) Electric Steel Corp.
Lebanon (Pa.) Steel Foundry.
Mackintosh-Hemphill Co., Pittsburgh
National-Erie Corp., Erie, Pa.
Unitcast Corp., Toledo, Ohio.

CASTINGS—Aluminum
Aluminum Co. of America, Pittsburgh.

CASTINGS—Brass, Bronze, Copper or Aluminum
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Cramp Brass & Iron Foundries Co., Philadelphia.
Ellison Bronze Co., Inc., Jamestown, New York.
National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.
Spencer's, I. S., Sons, Inc., Guilford, Ct.

CASTINGS—Bronze
Koppers Co., Bartlett Hayward Div., Baltimore, Md.

CASTINGS—Corrosion Resisting
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cramp Brass & Iron Foundries Co., Philadelphia.
Electro Alloys Co., Elyria, Ohio.
Meehanite Research Institute, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Phila., Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Wall-Colmonoy Corp., Detroit, Mich.

CASTINGS—Die
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS—Die, Aluminum
Aluminum Co. of America, Pittsburgh.

CASTINGS—Electric Steel
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Crucible Steel Castings Co., Lansdowne, Pa.
Lebanon (Pa.) Steel Foundry.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Unitcast Corp., Toledo, Ohio.

CASTINGS—Gray Iron
Advance Foundry Co., The, Dayton, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Engineering Co., Philadelphia.
Cramp Brass & Iron Foundries Co., Philadelphia.
Diamond Iron Works, Inc., Minneapolis, Minn.
Etna Machine Co., The, Toledo, Ohio.
Kline Hardware Co., Allentown, Pa.
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Lobdell Car Wheel Co., Nazel Hammer Div., Wilmington, Del.
National Roll & Fdry. Co., Avonmore, Pa.
North Wales (Pa.) Mach. Co., Inc.
Ramsey Chain Co., Inc., Albany, N. Y.
Spencer's, I. S., Sons, Inc., Guilford, Ct
Sprout, Waldron & Co., 1400 Sherman St., Muncy, Pa.

CASTINGS—High Test & Alloy Iron
Cramp Brass & Iron Foundries Co., Philadelphia.
Meehanite Research Institute, Pittsburgh, Pa.

CASTINGS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

CASTINGS—Malleable
Lake City Malleable Co., The, 5100 Lakeside Ave., Cleveland.
Peoria (Ill.) Malleable Castings Co.

CASTINGS—Meehanite Metal
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Meehanite Research Institute, Pittsburgh, Pa.

CASTINGS—Monel & Nickel
Cramp Brass & Iron Foundries Co., Philadelphia.

CASTINGS—Semi-Steel
Cramp Brass & Iron Foundries Co., Philadelphia.

CASTINGS—Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, Ohio.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Crucible Steel Castings Co., Lansdowne, Pa.
Hartford (Conn.) Electric Steel Corp.
Lebanon (Pa.) Steel Foundry.
Mackintosh-Hemphill Co., Pittsburgh
Mesta Mch. Co., Pittsburgh.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Standard Steel Wks. Div. The Baldwin Locomotive Works, Phila., Pa.
Strong Steel Foundry Co., Buffalo, N. Y.
Unitcast Corp., Toledo, Ohio.

CASTINGS—Wear Resisting
Meehanite Research Institute, Pittsburgh, Pa.
Wall-Colmonoy Corp., Detroit, Mich.

CEMENT—Acid-Proof
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CEMENT—Refractory
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Carborundum Co., The, Perth Amboy, N. J.
Johns-Manville Corp., 22 East 40th St., New York City.

CENTER LAPPING MACHINES
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

CENTERING MACHINES
Hendey Machine Co., Torrington, Conn.
Jones & Lamson Machine Co., Springfield, Vt.

CERAMIC SUPPLIES
Hommel, O., Co., The, Pittsburgh, Pa.

CHAINS—Conveyor & Elevator
Heyl & Patterson, Inc., Pittsburgh.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

CHAINS—Power Transmission
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link-Belt Co., 519 North Holmes Ave., Indianapolis, Ind.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—Roller
Link-Belt Co., 519 North Holmes Ave., Indianapolis, Ind.
Morse Chain Co., Ithaca, N. Y
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—Silent
Link-Belt Co., 519 North Holmes Ave., Indianapolis, Ind.
Morse Chain Co., Ithaca, N. Y
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAMFERING MACHINES (Gear)
Cimatool Co., The, Dayton, Ohio

CHANNELS—See Angles, Beams, Channels and Tees

CHARCOAL
Ogiebay, Norton & Co., Cleveland, Ohio.

CHECKS—Metal
Cunningham, M. E., Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.

CHEMICALS—Industrial
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CHEMICALS—Rust Proofing
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

Products Index

CHROMIUM METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

CHROMIUM — Plating — See Plating — Chromium

CHUCKING MACHINES—Automatic
Cleveland (Ohio) Automatic Machine Co., The.
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.

CHUCKING MACHINES—Multiple Spindle
Baird Mch. Co., The, Bridgeport, Conn.
Goss & DeLeeuw Machine Co., New Britain, Conn.
National Acme Co., The, Cleveland.
Potter & Johnston Machine Co., Pawtucket, R. I.

CHUCKS—Drill
Cleveland (Ohio) Twist Drill Co., The.
Cushman Chuck Co., Hartford, Conn.
Millers Falls Co., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
North Bros. Mfg. Co., Philadelphia, Pa.

CHUCKS—Drill, Quick Change
Apex Machine & Tool Co., The, Dayton, Ohio.

CHUCKS—Electric
Cushman Chuck Co., Hartford, Conn.

CHUCKS—Lathe
Cushman Chuck Co., Hartford, Conn.

CHUCKS—Magnetic
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

CHUCKS—Tapping
Apex Machine & Tool Co., The, Dayton, Ohio.

CIRCLES—Phosphor Bronze
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

CLAY GUNS
Bailey, Wm. M., Co., Pittsburgh, Pa.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Cowles Detergent Co., The, Cleveland, Ohio.
Detroit Rex Products Co., Detroit, Mich.
Ford, J. B., Sales Co., The, Wyandotte, Mich.
Pennsylvania Salt Mfg. Co., Phila., Pa.
Special Chemicals Corp., 32 Irving Place, New York City.

CLEANING EQUIPMENT (METAL)—Electro-Chemical
Bullard Co., The Bridgeport, Conn.

CLEANING EQUIPMENT—Metal
Detroit Rex Products Co., Detroit, Mich.

CLOTHING—Asbestos & Fireproof
American Optical Co., Southbridge, Mass.

CLUTCH-BRAKES—Magnetic
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

CLUTCHES
Fairbanks, Morse & Co., Chicago.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Hilliard Corp., The, Railroad Ave., Elmira, N. Y.
Morse Chain Co., Ithaca, N. Y.

CLUTCHES—Friction
Dodge Mfg. Corp., Mishawaka, Ind.
Twin Disc Clutch Co., Racine, Wis.

CLUTCHES—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., 728 Smith St., Milwaukee.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

CLUTCHES—Overrunning
Hilliard Corp., The, Railroad Ave., Elmira, N. Y.

CLUTCHES—Tractor
Twin Disc Clutch Co., Racine, Wis.

COAL
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Koppers Coal Co., The, Pittsburgh.
Oglebay, Norton & Co., Cleveland, Ohio.
Pickands Mather & Co., Cleveland.

COAL, ORE & ASH HANDLING MACHINERY
Heyl & Patterson, Inc., Pittsburgh.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

COBALT METAL
Central Trading Corp., 511 Fifth Ave., N. Y. C.

COILS—Lead
National Lead Co., 111 Bdway., N. Y. C.

COILS—Pipe
Harrisburg (Pa.) Steel Corp.

COILS—Tubing & Pipe
Swan Engineering Co., Inc., Newark, N. J.

COKE—Metallurgical
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Pickands Mather & Co., Cleveland.

COKE OVEN MACHINERY
Koppers Co., Engineering & Construction Div., Pittsburgh.

COLD ROLL FORMING MACHINES
McKay Machine Co., The, Youngstown, Ohio

COLLETS—Drill
Apex Machine & Tool Co., The, Dayton, Ohio.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

COMBUSTION CONTROLS
Brown Instrument Co., The, Philadelphia, Pa.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Morgan Construction Co., Worcester, Mass.

COMPOUNDS—Drawing and Cutting
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh, Pa.
Standard Oil Co. (Indiana), Chicago.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

COMPOUNDS—Lapping
Carborundum Co., The Niagara Falls, N. Y.
National Broach & Machine Co., Detroit, Mich.

COMPRESSORS—Air
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago.
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

COMPRESSORS—Rebuilt. (See Clearing House Section)

CONDENSERS—Surface & Jet
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONTACTS—Electrical
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

CONTRACTORS—Iron and Steel Industry
McKee, Arthur G., & Co., Cleveland, Ohio.

CONTRACTORS' SUPPLIES — Second-Hand. (See Clearing House Section)

CONTROL SYSTEMS—Temperature
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

CONTROLLERS—Crane
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

CONTROLLERS—Electric
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.
General Electric Co., Schenectady, N. Y.

CONTROLLERS—Valve, Electrically Operated
Brown Instrument Co., The, Philadelphia, Pa.
Cutler-Hammer, Inc., Milwaukee.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

CONTROLS—Time Cycle
Koppers Co., Bartlett Hayward Div., Baltimore, Md.

CONVEYING AND ELEVATING MACHINERY
Heyl & Patterson, Inc., Pittsburgh.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link-Belt Co., 300 West Pershing Road Chicago, Ill.
Logan Co., Inc., Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa

CONVEYOR WORMS
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.

CONVEYORS—Gravity
Logan Co., Inc., Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.

CONVEYORS—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

CONVEYORS—Portable
Jeffrey Mfg. Co., The, Columbus, Ohio.

COOLERS—For Cutting Oils
Harrison Radiator Div. General Motors Corp., Lockport, New York.

COPING MACHINES
Cleveland (Ohio) Punch & Shear Works Co., The.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

CORE GRINDERS—Power Operated
Milwaukee (Wis.) Foundry Equipment Co.

CORE OIL
Penola, Inc., Pittsburgh, Pa.
Sun Oil Co., Philadelphia.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

CORUNDUM WHEELS — See Grinding Wheels

COTTERS AND KEYS—Spring
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, Cleveland.
Western Wire Prods. Co., St. Louis, Mo

COUNTERBORES
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Cleveland (Ohio) Twist Drill Co., The.
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
Gairing Tool Co., Detroit
Morse Twist Drill & Mch. Co., New Bedford, Mass.

COUNTERS—Production
Streeter-Amet Co., Chicago.
Veeder-Root, Inc., Hartford, Ct.

COUNTING MACHINES
Veeder-Root, Inc., Hartford, Conn.

COUPLINGS—Cut-Off Friction
Hilliard Corp., The, Railroad Ave., Elmira, N. Y.

COUPLINGS—Flexible
Ajax Flexible Coupling Co., Westfield, N. Y.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Lovejoy Flexible Coupling Co., 4979 Lake St., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Poole Foundry & Mch. Co., Baltimore, Md.

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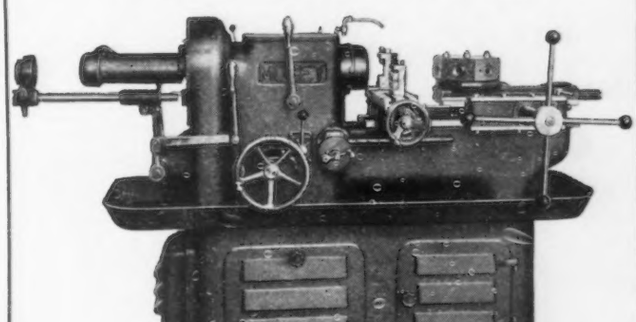

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Products Index

COUPLINGS—Fluid
Twin Disc Clutch Co., Racine, Wis.

COUPLINGS—Pipe
Champion Machine & Forging Co., The, Cleveland, Ohio.
Harrisburg (Pa.) Steel Corp.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

CRANES—Crawling Tractor
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, Ohio.

CRANES — Electric, Industrial, Truck Mounted
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANES—Electric Traveling
Armel, James P., Pittsburgh.
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Cleveland Tramrail Div. of The Cleveland Crane & Engrng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, Detroit, Mich.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Gantry
Cleveland Crane & Engineering Co. Wickliffe, Ohio.
Dravo Corp., Engineering Wks. Div. Pittsburgh.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Morgan Engineering Co., The, Alliance, O.
Shaw-Box Crane & Hoist Div. Manning Maxwell & Moore, Inc., 402 Broadway Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Hand Power
American Monorail Co., The, Cleveland.
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Cleveland Tramrail Div. of The Cleveland Crane & Engrng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Northern Engineering Works, Detroit.
Reading (Pa.) Chain & Block Corp.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Jib
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Whiting Corp., Harvey, Ill.

CRANES—Locomotive
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.
Ohio Locomotive Crane Co., The, Bucyrus, O.

CRANES—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Reading (Pa.) Chain & Block Corp.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Portable
Canton Foundry & Mach. Co., The, Div. of The Hill Acme Co., 6400 Breakwater Ave., Cleveland, Ohio.

CRANES—Portable Electric
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANKSHAFTS
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

CRANKSHAFTS—Forged
Ray City Forge Co., Erie, Pa.
Midvale Co., The, Nicetown, Phila., Pa.

CRUSHERS—Coal
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.
Jeffrey Mfg. Co., The, Columbus, Ohio.

CRUSHERS—Steel Turning
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

CUPOLA CHARGING EQUIPMENT
Atlas Car & Mfg. Co., The, Cleveland, Ohio.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.

CUTTERS & BURRS—Diemakers'
Chicago (Ill.) Wheel & Mfg. Co., 1101 W. Monroe St.

CUTTERS—Die Sinking
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Tomkins-Johnson Co., The, Jackson, Mich.

CUTTERS—Grinding Wheel—see Dressers—Grinding Wheel

CUTTERS—Keyseating
Davis Keyseater Co., 400 Exchange St. Rochester, N. Y.

CUTTERS—Milling
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Cleveland (Ohio) Twist Drill Co., The.
Gairing Tool Co., The, Detroit.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

CUTTERS—Rotary Slitting
Hill Acme Co., The, Cleveland, Ohio.

CUTTING-OFF MACHINES—Abrasive
Challenge Machinery Co., Grand Haven, Mich.
Tabor Mfg. Co., Phila.

CUTTING-OFF MACHINES—Cold Saw
Espen-Lucas Mch. Wks., Philadelphia.

CUTTING-OFF MACHINES—Pipe or Tubing
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Bardons & Oliver, Inc., Cleveland.
Cox & Sons Co., The, Bridgeton, N. J.
Landis Mch. Co., Inc., Waynesboro, Pa.

CUTTING OFF WHEELS
Carborundum Co., The Niagara Falls, N. Y.

CUTTING AND WELDING APPARATUS—Oxy-Acetylene—See Welding and Cutting Machines and Equipment—Oxy-Acetylene.

CYLINDERS — Compressed Air & Hydraulic
Hannifin Mfg. Co., Chicago, Ill.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.
Tomkins-Johnson Co., The, Jackson, Mich.

CYLINDERS—Seamless
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.
National Tube Co. (U. S. Steel Corp Subsidiary), Pittsburgh.

DEGREASING COMPOUNDS
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

DEGREASING MACHINES—Solvent
Detroit Rex Products Co., Detroit, Mich.

DESIGNING & DEVELOPING
Torrington (Conn.) Mfg. Co., The.

DIE BLOCKS—Drop Hammer
Heppenstall Co., Pittsburgh, Pa.

DIE CASTING MACHINES
Reed-Prentice Corp., Worcester, Mass.

DIE—Hard Carbide Inserts
McKenna Metals Co., Latrobe, Pa.

DIE SINKING MACHINES — Automatic and Hand
Cincinnati (Ohio) Milling Mch. Co., The.
Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.

DIEING MACHINES—Automatic
Henry & Wright Mfg. Co., The, Hartford, Conn.

DIES, JIGS, FIXTURES, etc.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

DIES—Cast Tool Steel
Advance Foundry Co., The, Dayton, Ohio.

DIES—Drawing & Sizing
Budd, Edward G., Mfg. Co., Philadelphia, Pa.
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.

DIES—Pipe Threading
Greenfield (Mass.) Tap & Die Corp.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit Mich.
National Acme Co., The, Cleveland.

DIES—Resistance Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

DIES—Screw and Thread Cutting
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., The, New Haven, Conn
Greenfield (Mass.) Tap & Die Corp.
Hill Acme Co., The, Cleveland, Ohio.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland.

DIES—Self-Opening Adjustable
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., The, New Haven, Conn.
Hill Acme Co., The, Cleveland, Ohio.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland, Ohio.

DIES—Sheet Metal Working
Budd, Edward G., Mfg. Co., Philadelphia, Pa.
Cimatool Co., The, Dayton, Ohio.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

DIES—Steel Marking
Cunningham, M. E., Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.

DIESEL FUEL INJECTORS
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

DOORS & SHUTTERS, Fireproof
Kinnear Mfg. Co., Columbus, Ohio.

DOORS & SHUTTERS — Steel or Wood Rolling
Kinnear Mfg. Co., Columbus, Ohio.
Malion, R. C., Co., Detroit, Mich.

DRAW BENCHES
McKay Machine Co., The, Youngstown, Ohio.

DRAWN WORK—Metal—See Stampings or Drawings—Metal

DRESSERS—Grinding Wheel
Carboloy Co., Inc., 11153 E. 8-Mile Rd., Detroit, Mich.

DRILLING MACHINES—Bench
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Continuous
Davis & Thompson Co., Milwaukee, Wis.

DRILLING MACHINES—Multiple Spindle
Henry & Wright Mfg. Co., The, Hartford, Conn.

DRILLING MACHINES—Portable Electric
Barnes, W. F. & John Co., Rockford, Ill.
Black & Decker Mfg. Co., The, Towson, Md.
Millers Falls Co., Greenfield, Mass.

DRILLING MACHINES—Portable Pneumatic
Helwig Mfg. Co., St. Paul, Minn.
Warner & Swasey Co., The, Cleveland.

DRILLING MACHINES—Radial
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.

DRILLING MACHINES—Sensitive
Buffalo (N. Y.) Forge Co., 492 Broadway.
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Upright
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Mch. Tool Co., Green Bay, Wis.

DRILLING MACHINES—Vertical
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Mch. Tool Co., Green Bay, Wis.

DRILLING MACHINES—Wall Radial
Lynd-Farquhar Co., Boston, Mass.

DRILLS—Hand & Breast
North Bros. Mfg. Co., Philadelphia, Pa.

DRIVES—Gear
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.

DRIVES—Single & Multiple V-Belts
Allis-Chalmers Mfg. Co., Milwaukee.

DROP FORGINGS—See Forgings—Drop Iron or Steel

DROP HAMMERS—See Hammers—Drop

DRYERS—Enameling
Ferro Enamel Corp., Cleveland, Ohio.

DUPLICATING MACHINES
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.

DUST COLLECTORS
Abrasive Machine Tool Co., East Providence, R. I.
American Blower Corp., 6000 Russell St., Detroit, Mich.
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
Mahon, R. C., Co., Detroit, Mich.
Pangborn Corporation, Hagerstown, Md.
Whiting Corp., Harvey, Ill.

ECONOMIZERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

ELECTRIC LIGHTING—Industrial
General Electric Co., Lamp Dept., Nela Park, Cleveland.
Westinghouse Electric & Mfg. Co., Lighting Div., Cleveland, Ohio.

ELECTRIC WELDING — See Welding — Electric

ELECTRICAL EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee.

ELECTRICAL MACHINERY — Second Hand. (See Clearing House Section)

ELECTRICAL WIRES
Roebling's, John A., Sons Co., Trenton, N. J.

ELECTRODE HOLDERS—Welding
Lincoln Electric Co., The, Cleveland.

ELECTRODES—Resistance Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

ELECTRODES—Welding, Coated
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Una Welding, Inc., Cleveland, Ohio.

ELECTROPLATING EQUIPMENT & SUPPLIES
Meaker Co., The, Chicago, Ill.
Special Chemicals Corp., 32 Irving Place, New York City.
United Chromium Incorporated, 51 East 42nd St., N. Y. C.

ELEVATORS—Material Handling
Link-Belt Co., 300 West Pershing Road, Chicago.

EMERY WHEELS—See Grinding Wheels

ENGINEERING AND ECONOMIC REPORTS—IRON & STEEL INDUSTRY
McKee, Arthur G., & Co., Cleveland, Ohio.

ENGINEERS—Blast Furnace and Steel Plants
McKee, Arthur G., & Co., Cleveland, Ohio.

ENGINEERS—Consulting and Industrial
Dubera Corp., 11 Broadway, N. Y. C.
Koppers Co., Engineering & Construction Div., Pittsburgh.
Lindemuth, Lewis B., 140 Cedar St., N. Y. C.

ENGINEERS—Consulting Management
Trundle Engineering Co., Cleveland, Ohio.

ENGINEERING—Production
Trundle Engineering Co., Cleveland, Ohio.

ENGINES—Gas
Fairbanks, Morse & Co., Chicago, Ill.

EXTENSION—Bit
North Bros. Mfg. Co., Philadelphia, Pa.

EYELET MACHINES
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

FACING MACHINES—Precision
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

FACTORY & PLANT SITES
Zoll, Edward H., 207 Market St., Newark, N. J.

FANS—Ventilating
American Blower Corp., 6000 Russell St., Detroit, Mich.
Buffalo (N. Y.) Forge Co., 492 Broadway.

FEED WATER HEATERS AND PURIFIERS
Harrisburg (Pa.) Steel Corp.

FEEDS—Hydraulic, for Machines
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

FELT—Wool Mechanical
American Felt Co., 315 Fourth Ave., N.Y.C.

FENCING—Wire
Pittsburgh (Pa.) Steel Co.

FERROALLOYS
Chromium Mining & Smelting Corp., Ltd., Hamilton, Canada.
Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.

FERROCHROME
Chromium Mining & Smelting Corp., Ltd., Hamilton, Canada.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Oglebay, Norton & Co., Cleveland, Ohio.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.

FERROMANGANESE
Bethlehem (Pa.) Steel Company.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Jones & Laughlin Steel Corp., Pittsburgh.
Oglebay, Norton & Co., Cleveland, Ohio.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank & Co., Inc., Philadelphia.

FERROMOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.

FERROPHOSPHORUS
Oglebay, Norton & Co., Cleveland, Ohio.

FERROSILICO MANGANESE
Oglebay, Norton & Co., Cleveland, Ohio.
Ohio Ferro-Alloys Corp., Canton, Ohio.

FERROSILICON
Cleveland-Cliffs Iron Co., The, Cleveland Ohio.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Oglebay, Norton & Co., Cleveland, Ohio.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.

FERROSPIEGELEISEN
New Jersey Zinc Co., The, 160 Front St., N. Y. C.
Oglebay, Norton & Co., Cleveland, Ohio.

FERROTITANIUM
Metal & Thermit Corp., 120 Broadway, N. Y. C.

FERROVANADIUM
Electro Metallurgical Sales Corp., 30 E 42nd St., N. Y. C.

FIBRE—Sheets, Tubes, Rods, Fabricated Parts
Continental-Diamond Fibre Co., Newark, Delaware.

FILES & RASPS
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.
Grobet File Corp. of America, 3 Park Place, N. Y. C.
Nicholson File Co., Providence, R. I.

FILING MACHINES
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.

FILTER CLOTH—Asbestos
Johns-Manville Corp., 22 East 40th St. New York City.

FILTERS—Air
Whiting Corp., Harvey, Ill.

FILTERS—Oil
National Acme Co., The, Cleveland.

FIRE BRICK
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Carborundum Co., The Perth Amboy, N. J.

FIRE BRICK—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

FIRE CLAY
Illinois Clay Products Co., Joliet, Ill.

FITTINGS—Brass, Pipe and Tube
Commonwealth Brass Corp., Detroit, Mich.

FITTINGS—Welding
Crane Co., Chicago, Ill.

Products Index

FLANGES—Forged Steel
Harrisburg (Pa.) Steel Corp.
Standard Steel Wks. Div. The Baldwin Locomotive Works, Phila., Pa.

FLANGES—Welded Steel
King Fifth Wheel Co., 5031 Beaumont Ave., Philadelphia.

FLANGING WORK—Carbon and Alloy
Worth Steel Co., Claymont, Del.

FLEXIBLE SHAFT EQUIPMENT
Lovejoy Flexible Coupling Co., 4979 Lake St., Chicago, Ill.
Strand, N. A., & Co., Chicago.

FLOODLIGHTS—Acetylene
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FLOOR (CONCRETE) Repair Materials
Flexrock Co., 2328 Manning St., Philadelphia, Pa.

FLOOR PLATES—See Plates—Floor or Cellar Door

FLOORING—Acid Proof
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

FLOORING—Monolithic
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St. New York City.

FLOORING—Open Steel
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
Borden Metal Products Co., Elizabeth, New Jersey.
Dravo Corp., Engineering Wks. Div., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.
Kerlow Steel Flooring Co., Jersey City, N. J.

FLUORSPAR
Hillside Fluor Spar Mines, 38 S. Dearborn St., Chicago, Ill.

FLUX—Hard Soldering
Special Chemicals Corp., 32 Irving Place, New York City.

FLUX—Soldering (Stainless Steel)
Ruby Chemical Co., Columbus, Ohio.

FLUX—Welding
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FORGING MACHINES—Roll
Ajax Mfg. Co., The, Cleveland, Ohio.

FORGING MACHINES—Upset
Ajax Mfg. Co., The, Cleveland, Ohio.
Hill Acme Co., The, Cleveland, Ohio.

FORGINGS—Alloy Steel
Hepenstall Co., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Aluminum
Aluminum Co. of America, Pittsburgh.

FORGINGS—Brass, Bronze or Copper
American Brass Co., The, Waterbury, Conn.
Chase Brass & Copper Co., Inc., 40 Roland St., Waterbury, Conn.
Commonwealth Brass Corp., Detroit.
Cramp Brass & Iron Foundries Co., Philadelphia.
Harvey Metal Corp., The, Chicago, Ill.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Titan Metal Mfg. Co., Bellefonte, Pa.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

FORGINGS—Coin Pressed
Rockford (Ill.) Drop Forge Co.

FORGINGS—Drop, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Canton (Ohio) Drop Forging & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Champion Machine & Forging Co., The, Cleveland, Ohio.
Herbrand Corp., The, Fremont, Ohio.
Poor & Co., Canton Forge & Axle Wks., Canton, Ohio
Rockford (Ill.) Drop Forge Co.
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Wilcox, D., Mfg. Co., Mechanicsburg, Pa.
Williams, J. H., & Co., Buffalo, N. Y.

FORGINGS—Hammered
Vulcan Steam Forging Co., Buffalo, N. Y.

FORGINGS—Hollow
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Hollow Bored
American Hollow Boring Co., 1912 Raspberry St., Erie, Pa.

FORGINGS—Hydraulic Press
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., Erie, Pa.
Bethlehem (Pa.) Steel Company.
Mesta Mch. Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa
Standard Steel Wks. Div. The Baldwin Locomotive Works, Phila., Pa.

FORGINGS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

FORGINGS—Tool Steel
Vulcan Steam Forging Co., Buffalo, N. Y.

FORGINGS—Upset
Bethlehem (Pa.) Steel Company.
Lamson & Sessions Co., The, Cleveland.
Rockford (Ill.) Drop Forge Co.
Standard Tube Co., The, Detroit, Mich.

FOUNDRY EQUIPMENT & SUPPLIES
Jeffrey Mfg. Co., The, Columbus, Ohio.
Whiting Corp., Harvey, Ill.

FURNACE CONTROLS—Automatic
Amsler-Morton Co., The, Pittsburgh, Pa.

FURNACES—Billet or Ingot Heating
Amsler-Morton Co., The, Pittsburgh, Pa.
Salem (Ohio) Engineering Co.
Swindell-Dressler Corp., Box 1888, Pittsburgh, Pa.
Wean Engineering Co., Inc., Warren, Ohio.

FURNACES—Brass Melting
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Electric, Steel Melting
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Detroit Electric Furnace Div. Kuhlman Electric Co., Bay City, Mich.
Pittsburgh (Pa.) Lectromelt Furnace Corp.
Swindell-Dressler Corp., Box 1888, Pittsburgh, Pa.

FURNACES—Enameling
Electric Furnace Co., The, Salem, Ohio.
Ferro Enamel Corp., Cleveland, Ohio.
General Electric Co., Schenectady, N. Y

FURNACES—Forging
Electric Furnace Co., The, Salem, Ohio.
Holcroft & Co., Detroit.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.
Wean Engineering Co., Inc., Warren, Ohio.

FURNACES—Heat Treating, Automatic
American Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Salem, Ohio.
Holcroft & Co., Detroit.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Rockwell, W. S., Co., 50 Church St., N.Y.C
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.
Wean Engineering Co., Inc., Warren, Ohio.

FURNACES—Heat Treating, Controlled Atmosphere
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.

FURNACES—Heat Treating, Cyanide or Lead
Electric Furnace Co., The, Salem, Ohio.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Electric
Despatch Oven Co., Minneapolis, Minn.
Electric Furnace Co., The, Salem, Ohio.
General Electric Co., Schenectady, N. Y.
Holcroft & Co., Detroit.
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Rockwell, W. S., Co., 50 Church St., N.Y.C
Salem (Ohio) Engineering Co.
Swindell-Dressler Corp., Box 1888, Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES—Heat Treating, Oil or Gas
American Gas Furnace Co., Elizabeth, N. J.
Despatch Oven Co., Minneapolis, Minn.
Electric Furnace Co., The, Salem, Ohio.
Holcroft & Co., Detroit.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Pennsylvania Industrial Engineers, Pittsburgh.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.
Swindell-Dressler Corp., Box 18888, Pittsburgh, Pa.
Wean Engineering Co., Inc., Warren, Ohio.

FURNACES, HEATING—Continuous
Amsler-Morton Co., The, Pittsburgh, Pa.

FURNACES—Non-Ferrous Melting
Detroit Electric Furnace Div. Kuhlman Electric Co., Bay City, Mich.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.

FURNACES—Open Hearth, Consultant
Lindemuth, Lewis B., 140 Cedar St., N. Y. C.

FURNACES—Open Hearth Plants
Amsler-Morton Co., The, Pittsburgh, Pa.
McKee, Arthur G., & Co., Cleveland, Ohio.

FURNACES—Pack Heating Sheets
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Wean Engineering Co., Inc., The, Warren, Ohio.

FURNACES—Rivet Heating, Gas
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Tempering
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.

FURNACES—Wire Annealing and Galvanizing
General Electric Co., Schenectady, N. Y.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

GAGE BLOCKS
Ford Motor Co. (C. E. Johansson Division), Dearborn, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

GAGES—Electric
Sheffield Gage Corp., Dayton, Ohio.

GAGES—Plug and Snap
Greenfield (Mass.) Tap & Die Corp.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
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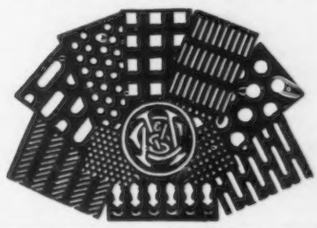

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Products Index

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Brown Instrument Co., The, Philadelphia, Pa.

GAGES—Sheet Thickness
Streeter-Amet Co., Chicago.

GAGES—Surface
Millers Falls Co., Greenfield, Mass.

GAGES—Thickness Automatic
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

GAGES—Thickness, for Rolling Mills
Haines Gauge Co., The, Phila., Pa.

GAGES—Thread Lead
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mch. Co., Springfield, Vt.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Sheffield Gage Corp., Dayton, Ohio.

GALVANIZED IRON PRIME COATING
American Chemical Paint Co., Ambler, Pa.

GALVANIZING—Electro
Meaker Co., The, Chicago, Ill.

GALVANIZING—Hot Dip
American Hot Dip Galvanizers Ass'n, Inc., Pittsburgh.
Cattie, Joseph P., & Bros., Phila.
Enterprise Galvanizing Co., Philadelphia.
Ohio Galvanizing & Mfg. Co., The, Niles, Ohio.
Southern Galvanizing Co., Baltimore, Md.

GALVANIZING COMPOUNDS
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

GALVANIZING PLANTS—For Sheets
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Erie (Pa.) Foundry Co.

GALVANIZING PROCESS—Electro, Wire
Meaker Co., The, Chicago, Ill.

GAS ANALYSIS RECORDERS
Brown Instrument Co., The, Philadelphia, Pa.
Leeds & Northrup Co., 4956 Stenton Ave. Philadelphia.

GAS CLEANING EQUIPMENT — Blast Furnaces
McKee, Arthur G., & Co., Cleveland.

GAS FOR INDUSTRIAL USES
American Gas Association, 420 Lexington Ave., N. Y. C.

GAS PRODUCERS
Koppers Co., Engineering & Construction Div., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., & Co., Philadelphia, Pa.

GAS—Boosters & Exhausters
Roots-Connersville Blower Corp., Connersville, Ind.

GASKETS—Asbestos, Metal or Rubber
Garlock Packing Co., The, Palmyra, N. Y.
Johns-Manville Corp., 22 East 40th St., New York City.

GEAR CHECKING EQUIPMENT
Michigan Tool Co., Detroit, Mich.

GEAR CUTTING
Earle Gear & Machine Co., Phila.
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Gleason Works, Rochester, N. Y.
Hartford (Conn.) Special Machinery Co. The.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

GEAR CUTTING MACHINES
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Gleason Works, Rochester, N. Y.

GEAR DRIVES—Herringbone
Continental Roll & Steel Foundry Co., East Chicago, Ind.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Pitgh.

GEAR LAPPING MACHINES
Michigan Tool Co., Detroit, Mich
National Broach & Machine Co., Detroit, Mich.

GEARMOTORS
Allis-Chalmers Mfg. Co., Milwaukee.
General Electric Co., Schenectady, N. Y.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Westinghouse Elec. & Mfg. Co., East Pitgh.

GEAR PLANING MACHINES
Gleason Works, Rochester, N. Y.

GEAR SHAVING MACHINES
Michigan Tool Co., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.

GEAR TESTING MACHINES
National Broach & Machine Co., Detroit Mich.

GEARS—Bevel
Gleason Works, Rochester, N. Y.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
National-Erie Corp., Erie, Pa.

GEARS—Heat Treated
Gleason Works, Rochester, N. Y.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Herringbone
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Mesta Mch. Co., Pittsburgh.

GEARS—Machine Cut
Gleason Works, Rochester, N. Y.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Machine Molded
Poole Foundry & Mch. Co., Baltimore, Md.

GEARS—Non-Metallic
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Continental-Diamond Fibre Co., Newark, Delaware.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.

GEARS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

GEARS—Reverse
Twin Disc Clutch Co., Racine, Wis.

GEARS—Reverse Marine
Twin Disc Clutch Co., Racine, Wis.

GEARS—Spur
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Teeth Ground
Hartford (Conn.) Special Machinery Co., The.

GEARS—Worm
Cone Worm Gear Div., Michigan Tool Co., Detroit, Mich.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.

GENERATORS—Acetylene
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

GENERATORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hobart Bros., Troy, Ohio.
Lincoln Electric Co., The, Cleveland.
Westinghouse Elec. & Mfg. Co., East Pitgh.

GENERATORS—Electric, Second Hand. (See Clearing House Section)

GENERATORS—Plating
Meaker Co., The, Chicago, Ill.

GLOVES—Asbestos & Fireproof
American Optical Co., Southbridge, Mass.

GOGGLES—Safety
American Optical Co., Southbridge, Mass.

GOVERNORS—Air Compressor
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

GRADUATING MACHINES—Metal
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.

GRATING—Flooring, Sidewalk, etc.—See Flooring—Open Steel

GREASE—Lubricating
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

GRILLES—Metal Cane
Diamond Mfg. Co., Wyoming, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

GRILLES—Perforated Metal
Diamond Mfg. Co., Wyoming, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., The, Chicago.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

GRINDERS—Carbide Tool
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

GRINDING
Defiance Screw Mch. Prods. Div. of The Serrick Corp., Defiance, Ohio.

GRINDING AND POLISHING MACHINES
Black & Decker Mfg. Co., The, Towson, Md.
Bryant Machinery & Engineering Co., Chicago.
Excelsior Tool & Mch. Co., E. St. Louis, Ill
Norton Co., Worcester, Mass.
Safety Grinding Wheel & Machine Co., The, Springfield, Ohio.
Vonnegut Moulder Corp., Indianapolis, Ind.

GRINDING MACHINES—Centerless
Cincinnati (Ohio) Grinders Incorporated.

GRINDING MACHINES—Chucking
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING MACHINES — Cutter & Reamer
Cincinnati (Ohio) Milling Mch. Co., The.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Machine Tool Co., Cincinnati.

GRINDING MACHINES—Cylinder
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES—Cylindrical
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati (Ohio) Grinders Incorporated.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Die
Landis Mch. Co., Inc., Waynesboro, Pa.

GRINDING MACHINES—Drill
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

GRINDING MACHINES—Gear & Worm
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

GRINDING MACHINES—Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES—Internal Centerless
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES—Internal Multiple Spindle
Baird Mch. Co., The, Bridgeport, Conn.

GRINDING MACHINES—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.
Chicago (Ill.) Wheel & Mfg. Co., 1101 W. Monroe St.
Millers Falls Co., Greenfield, Mass.

GRINDING MACHINES—Portable Flexible Shaft
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hardford, Conn.
Strand, N. A., & Co., Chicago.

GRINDING MACHINES—Precision Thread
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

GRINDING MACHINES—Roll
Cincinnati (Ohio) Grinders Incorporated.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Snagging
Black & Decker Mfg. Co., The, Towson, Md.
Safety Grinding Wheel & Machine Co., The, Springfield, Ohio.
Vonnegut Moulder Corp., Indianapolis, Ind.

GRINDING MACHINES—Surface
Abrasive Machine Tool Co., E. Prov., R. I.
Blanchard Machine Co., Cambridge, Mass.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Heald Machine Co., Worcester, Mass.
Hill Acme Co., The, Cleveland, Ohio.
Mattison Machine Works, Rockford, Ill.
Norton Co., Worcester, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

GRINDING MACHINES—Swing Frame
Black & Decker Mfg. Co., The, Towson, Md.
Safety Grinding Wheel & Machine Co., The, Springfield, Ohio.
Shuster, F. B., Co., The, New Haven.
Vonnegut Moulder Corp., Indianapolis, Ind.

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Gallmeyer & Livingston Co., Grand Rapids, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

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Gallmeyer & Livingston Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
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LeBlond, R. K., Mch. Tool Co., Cincinnati.
Norton Co., Worcester, Mass.
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Norton Co., Worcester, Mass.

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Landis Tool Co., Waynesboro, Pa.

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Blanchard Machine Co., Cambridge, Mass.
Carborundum Co., The Niagara Falls, N. Y.
Chicago (Ill.) Wheel & Mfg. Co., 1101 W. Monroe St.
Macklin Company, Jackson, Mich.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.
Norton Co., Worcester, Mass.
Safety Grinding Wheel & Machine Co., The, Springfield, Ohio.

GRINDING WHEELS—Mounted, Pencil
Chicago (Ill.) Wheel & Mfg. Co., 1101 W. Monroe St.

GRINDING WHEELS—Segment
Blanchard Machine Co., Cambridge, Mass.

GRIT—Steel
Harrison Abrasive Corp., Manchester, N. H.
Pittsburgh (Pa.) Crushed Steel Co.

HACK SAW BLADES—See Saws—Hack Saw Blades

HACK SAW MACHINES
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Peerless Machine Co., 1613 Junction Ave., Racine, Wis.

HAMMERS—Air, Forging
Chambersburg (Pa.) Engineering Co.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Lobdell Car Wheel Co., Nazel Hammer Div., Wilmington, Del.

HAMMERS—Drop
Ajax Mfg. Co., The, Cleveland.
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
Morgan Engineering Co., The, Alliance, O.

HAMMERS—Helve
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

HAMMERS—Machinists'
Usico Mfg. Co., Inc., 135 Tonawanda St., Buffalo, N. Y.

HAMMERS—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.

HAMMERS—Power
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

HAMMERS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., 1306 Elston Ave.

HAMMERS—Steam
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
Morgan Engineering Co., The, Alliance, O.

HAMMERS—Welder's Chipping
Chicago (Ill.) Mfg. & Distributing Co.

HANGER BEARINGS
Dodge Mfg. Corp., Mishawaka, Ind.

HANGERS—Ball Bearing
Fafnir Bearing Co., New Britain, Conn.
S K F Industries, Inc., Front St. & Erie Ave., Phila., Pa.

HANGERS—Roller Bearing
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.

HANGERS—Shaft
Dodge Mfg. Corp., Mishawaka, Ind.

HEADING MACHINES
Ajax Mfg. Co., The, Cleveland, Ohio.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

HEADS—Spun and Pressed
Worth Steel Co., Claymont, Del.

HEAT EXCHANGERS
Harrison Radiator Div. General Motors Corp., Lockport, New York.

HEAT TREATING
Barnes-Gibson-Raymond, Detroit Plant Div. of Associated Spring Corp.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
General Machine Wks., York, Pa.
Parish Pressed Steel Co., Reading, Pa.
Pennsylvania Industrial Engineers, Pittsburgh.
Vulcan Steam Forging Co., Buffalo, N. Y.

HEATERS—Unit
Dravo Corp., Engineering Wks. Div., Pittsburgh.

HOISTS—Air
Detroit (Mich.) Hoist & Mach. Co.
Northern Engineering Works, Detroit.

HOISTS—Chain
Reading (Pa.) Chain & Block Corp.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

HOISTS—Electric
American Engineering Co., Philadelphia.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Detroit (Mich.) Hoist & Mach. Co.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Northern Engineering Works, Detroit, Mich.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

HOISTS—Electric Traveling
American Engineering Co., Philadelphia.
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

HOISTS—Monorail
American Engineering Co., Philadelphia.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HONING MACHINES
Micromatic Hone Corp., Detroit, Mich.

HOSE—Air, Oil, Steam and Water
Hewitt Rubber Corp., Buffalo, N. Y.

HOSE—Flexible Metallic
American Brass Co., The, Waterbury, Conn.

HOSE—Rubber
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

HOT TOPS
Oglebay, Norton & Co., Cleveland, Ohio.

HYDRANTS—Fire
Wood, R. D., & Co., Philadelphia, Pa.

HYDRAULIC MACHINERY
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Denison Engineering Co., The, 108 W. Chestnut St., Columbus, Ohio.
Farquhar, A. B., Co., Ltd., York, Pa.
Hannifin Mfg. Co., Chicago, Ill.

Products Index

Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., The, Alliance, O.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia, Pa.

HYDRAULIC POWER UNITS
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.
Twin Disc Clutch Co., Racine, Wis.

INGOT MOLDS
Shenango-Penn Mold Co., Dover, Ohio.
Valley Mould & Iron Corp., Hubbard, Ohio.

INGOTS—Aluminum
Aluminum Co. of America, Pittsburgh.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.

INSTRUMENTS—Electric
General Electric Co., Schenectady, N. Y.

INSTRUMENTS—Recording
Brown Instrument Co., The, Philadelphia, Pa.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

INSULATING MATERIALS—Electrical
Continental-Diamond Fibre Co., Newark, Delaware.

INSULATION
Illinois Clay Products Co., Joliet, Ill.
Johns-Manville Corp., 22 East 40th St., New York City.

IRON—Genuine Open Hearth Iron
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.

IRON—Rustless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

IRON WORKERS—Universal
Buffalo (N. Y.) Forge Co., 492 Broadway.

JIGS, FIXTURES, DIES, etc. (See Dies, Jigs, Fixtures, etc.)

KEYS—Riveted
Western Wire Prods. Co., St. Louis, Mo.

KEYSEATING MACHINES
Davis Keyseater Co., 400 Exchange St., Rochester, N. Y.

KNIVES—Machine
Hill Acme Co., The, Cleveland, Ohio.

LACING—Belt, Rawhide or Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

LAMPS—Filament
General Electric Co., Lamp Dept., Nela Park, Cleveland.
Westinghouse Electric & Mfg. Co., Lighting Div., Cleveland, Ohio.

LAMPS—Mercury Vapor
General Electric Co., Lamp Dept., Nela Park, Cleveland.

LAPPING MACHINES
Cincinnati (Ohio) Grinders Incorporated.

LAPPING PLATES
Challenge Machinery Co., Grand Haven, Mich.

LATHE ATTACHMENTS
Hendey Machine Co., Torrington, Conn.
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—Automatic
Baird Mch. Co., The, Brideport, Conn.
Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Goss & De Leeuw Mch. Co., New Britain, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Cincinnatti.
Monarch Mch. Tool Co., The, Sidney, O.
Potter & Johnston Machine Co., Pawtucket, R. I.

LATHES—Automatic Turret
Potter & Johnston Machine Co., Pawtucket, R. I.

LATHES—Automatic Vertical
Baird Mch. Co., The, Bridgeport, Conn.
Bullard Co., The, Bridgeport, Conn.

LATHES—Bench
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—Brass
Gisholt Machine Co., Madison, Wisconsin.
Jones & Lamson Machine Co., Springfield, Vt.
South Bend (Ind.) Lathe Works, 587 East Madison St.
Warner & Swasey Co., The, Cleveland.

LATHES—Car-Wheel
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

LATHES—Chucking
Gisholt Machine Co., Madison, Wisconsin.
Jones & Lamson Mch. Co., Springfield, Vt.
Potter & Johnston Machine Co., Pawtucket, R. I.
South Bend (Ind.) Lathe Works, 587 East Madison St.
Warner & Swasey Co., The, Cleveland.

LATHES—Contour Turning
Monarch Mch. Tool Co., The, Sidney, O.

LATHES—Crankshaft
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Potter & Johnston Machine Co., Pawtucket, R. I.

LATHES—Engine
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Lathe & Tool Co.
Hendey Machine Co., Torrington, Conn.
Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—High Speed
Hendey Machine Co., Torrington, Conn.
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—Roll
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

LATHES — Second-Hand. (See Clearing House Section)

LATHES—Toolroom
Cincinnati (Ohio) Lathe & Tool Co.
LeBlond, R. K., Machine Tool Co., Cincinnati, Ohio.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—Turret
Acme Machine Tool Co., The, Cincinnati, Ohio.
Bardons & Oliver, Inc., Cleveland.
Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Mch. Co., Springfield, Vt.
Morey Machinery Co., Inc., 410 Broome St., New York City.
South Bend (Ind.) Lathe Works, 587 East Madison St.
Warner & Swasey Co., The, Cleveland.

LATHES, Turret, Vertical
Bullard Co., The, Bridgeport, Conn.

LAYOUT SURFACE PLATES
Challenge Machinery Co., Grand Haven, Mich.

LEAD LININGS
National Lead Co., 111 Bdway., N. Y. C.

LEAD—In Oil
National Lead Co., 111 Bdway., N. Y. C.

LEAD—Tellurium
National Lead Co., 111 Bdway., N. Y. C.

LEATHER—Cup
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

LEGGINS—Safety
American Optical Co., Southbridge, Mass.

LEVELING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
McKay Machine Co., The, Youngstown, Ohio.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Wean Engineering Co., Inc., The, Warren, O.

LOCOMOTIVES—Diesel
Atlas Car & Mfg. Co., The, Cleveland, Ohio.

LOCOMOTIVES—Gasoline
Plymouth (Ohio) Locomotive Works Div. Fate-Root-Heath Co.

LOCOMOTIVES—Industrial
Jeffrey Mfg. Co., The, Columbus, Ohio.
Plymouth (Ohio) Locomotive Works Div Fate-Root-Heath Co.

LOCOMOTIVES—Steam
Iron & Steel Products, Inc., Chicago.

LUBRICANTS—Crusher & Grinding
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Gear
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—High Pressure & Temperature
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh, Pa.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Mine Cars
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

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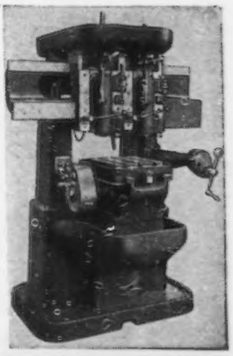

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

Products Index

LUBRICANTS—Mining Machines
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Railroad
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Roll Neck—Anti-Friction & Plain
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh, Pa.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 E. 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Tipple & Cleaning
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco; Shell Bldg., St. Louis, and 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

MACHINE WORK
Diamond Iron Works, Inc., Minneapolis, Minn.
General Machine Works, York, Pa.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.
Treadwell Engineering Co., Easton, Pa.

MACHINERY DEALERS—Second-Hand (See Clearing House Section)

MACHINISTS' SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.

MAGNESIUM
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

MAGNETS—Lifting
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., 728 Smith St., Milwaukee.
Electric Controller & Mfg. Co., The, Cleve.
Ohio Electric Mfg. Co., The, 5908 Maurice Ave., Cleveland.

MAGNETS — Separating—See Separators —Magnetic

MALLETS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

MANAGEMENT ENGINEERING
Trundle Engineering Co., Cleveland, Ohio.

MANDRELS—Expanding
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

MANGANESE ORES—See ORES—Manganese

MANHOLE FITTINGS AND SADDLES
Worth Steel Co., Claymont, Del.

MANIFOLDS—Oxygen & Acetylene
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

MARKING MACHINES
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.

METAL CLEANING COMPOUNDS
Cowles Detergent Co., The, Cleveland, Ohio.
Detroit Rex Products Co., Detroit, Mich.
Ford, J. B. Sales Co., The, Wyandotte, Mich.
Pennsylvania Salt Mfg. Co., Philadelphia.

METAL SPECIALTIES
Borden Metal Products Co., Elizabeth, New Jersey.
Budd, Edward G., Mfg. Co., Philadelphia, Pa.
Chase Brass & Copper Co., Inc., 40 Roland St., Waterbury, Conn.
Crosby Co., The, Buffalo, N. Y.
Greist Mfg. Co., The, 646 Blake St., New Haven, Conn.
Mattatuck Mfg. Co., The, 1900 East Main St., Waterbury, Conn.
Torrington (Conn.) Company.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

METERS—Electric Welding
Lincoln Electric Co., The, Cleveland.

METERS—Flow
Brown Instrument Co., The, Philadelphia, Pa.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

METERS—Gas or Air
Roots-Connersville Blower Corp., Connersville, Ind.

MICA
Continental-Diamond Fibre Co., Newark, Delaware.

MICROMETERS—Dial for Sheet Metal
Haines Gauge Co., The, Phila., Pa.

MICROMETERS—Tubular Bow & Bar
Davis & Thompson Co., Milwaukee, Wis.

MICROSCOPES — Illuminated Measuring and Inspection
Pike, E. W., & Co., Elizabeth, N. J.

MILLING MACHINES—Automatic
Cincinnati (Ohio) Milling Mch. Co., The.
Jones & Lamson Machine Co., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wisc.

MILLING MACHINES—Continuous
Davis & Thompson Co., Milwaukee, Wis.

MILLING MACHINES—Horizontal
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
Kearney & Trecker Corp., Milwaukee, Wisc.
Ohio Machine Tool Co., Kenton, Ohio.

MILLING MACHINES—Planer Type
Cincinnati (Ohio) Planer Co.
Consolidated Machine Tool Corp., Rochester, N. Y.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

MILLING MACHINES — Second - Hand. (See Clearing House Section)

MILLING MACHINES—Vertical
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
Kearney & Trecker Corp., Milwaukee, Wisc.
National Broach & Machine Co., Detroit, Mich.
Reed-Prentice Corp., Worcester, Mass.

MILLING & PROFILING MACHINES
Morey Machinery Co., Inc., 410 Broome St., New York City.

MOLDING MACHINES
Tabor Mfg. Co., Phila., Pa.

MOLDING MACHINES—Jolt Pin Strip
Milwaukee (Wis.) Foundry Equipment Co.

MOLDING MACHINES — Jolt Squeeze Rollover Pattern Draw
Milwaukee (Wis.) Foundry Equipment Co.

MOLDING MACHINES—Jolt Squeeze Stripper
Milwaukee (Wis.) Foundry Equipment Co.

MOLDING MACHINES—Jolt Squeezer
Milwaukee (Wis.) Foundry Equipment Co.

MOLDING MACHINES—Power Strippers
Milwaukee (Wis.) Foundry Equipment Co.

MOLDING MACHINES—Rollover (Power Operated)
Milwaukee (Wis.) Foundry Equipment Co.

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.

MONEL METAL
International Nickel Co., Inc., The, 67 Wall St., N. Y. C.

MONORAIL SYSTEMS—Hand & Electric
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

MOTORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee.
Delco Products Div. General Motors Corp., Dayton, Ohio.
Fairbanks, Morse & Co., Chicago.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Howell (Mich.) Electric Motors Co.
Lincoln Electric Co., Cleveland.
Westinghouse Elec. & Mfg. Co., E. Ptgh.

MOTORS—Electric, Second-Hand. (See Clearing House Section)

MUFFLES—Alloy
Electro Alloys Co., Elyria, Ohio.

NAILS—Wire
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Pittsburgh (Pa.) Steel Co.
Wickwire Brothers, Cortland, N. Y.
Youngstown (Ohio) Sheet & Tube Co., The

NIBBLING MACHINES
Gray Machine Co., Philadelphia.

NIBS—Lathe & Grinder Center
McKenna Metals Co., Latrobe, Pa.

NICKEL
International Nickel Co., Inc., The, 67 Wall St., N. Y. C.

NITROGEN
Air Reduction, 60 East 42nd St., N. Y. C.

NOZZLES—Sand Blasting
Norton Co., Worcester, Mass.

NUMBERING MACHINES—For Metal
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.

NUT MACHINERY — Automatic Cold Pressed
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

NUTS—Castellated
Cleveland (Ohio) Cap Screw Co., The.
National Acme Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Lock
Elastic Stop Nut Corp., Union, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

NUTS—Machine Screw
Progressive Mfg. Co., Torrington, Conn.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Semi-Finished
Cleveland (Ohio) Cap Screw Co., The.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Wing
Parker-Kalon Corp., 200 Varick St., N. Y. C.

OIL & GREASE SEALS
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Garlock Packing Co., The, Palmyra, N. Y.

OIL RETAINERS
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

OIL STONES
Norton Co., Worcester, Mass.

OILS—Cutting
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Penola, Inc., Pittsburgh, Pa.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago, Ill.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Fuel
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Standard Oil Co. (Indiana), Chicago, Ill.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Lubricating
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Texas Company, The, 135 East 42nd St. N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Soluble—See Oils—Cutting

ORE BRIDGES
Dravo Corp., Engineering Wks. Div., Pittsburgh.

ORES—Iron
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Oglebay, Norton & Co., Cleveland, Ohio.
Pickands Mather & Co., Cleveland.

ORES—Manganese
Cuban-American Manganese Corp., 122 East 42nd St., N. Y. C.

OVENS—Coke and By-Product Recovery
Koppers Co., Engineering & Construction Div., Pittsburgh.

OVENS—Core and Mold
Holcroft & Co., Detroit.
Mahon, R. C., Co., Detroit, Mich.

OVENS—Drying
Despatch Oven Co., Minneapolis, Minn.

OVENS—Enameling and Japanning
Despatch Oven Co., Minneapolis, Minn.
Ferro Enamel Corp., Cleveland, Ohio.
Kirk & Blum Mfg. Co., The, Cincinnati, Ohio.
Mahon, R. C., Co., Detroit, Mich.

OXY-ACETYLENE — Shape-Cutting Machines
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

OXYGEN
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

PACKING—Felt
American Felt Co., 315 Fourth Ave., N. Y. C.

PACKING—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Garlock Packing Co., The, Palmyra, N. Y.

PACKING—Locomotive Cylinder
Koppers Co., American Hammered Piston Ring Div., Baltimore, Md.

PACKING—Metallic
Garlock Packing Co., The, Palmyra, N. Y.

PACKING—Rubber
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

PACKING—Sheet, Asbestos or Rubber
Carey, Philip, Co., The, Cincinnati, Ohio.
Garlock Packing Co., The, Palmyra, N. Y.
Hewitt Rubber Corp., Buffalo, N. Y.
Johns-Manville Corp., 22 East 40th St., New York City.

PAINT
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
National Lead Co., 111 Bdway., N. Y. C.

PAINT—Acid Proof
Watson-Standard Co., The, Pittsburgh, Pa.

PARALLELS
Challenge Machinery Co., Grand Haven, Mich.
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

PERFORATED METAL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Perforating Co., 2440 W 24th Place, Chicago, Ill.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., The, Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa.

PICKLING EQUIPMENT COATING
Watson-Standard Co., The, Pittsburgh, Pa.

PICKLING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Mesta Mch. Co., Pittsburgh.

PICKLING TANK LININGS
Celicote Co., The, Cleveland, Ohio.
National Lead Co., 111 Bdway., N. Y. C

PICKLING TANK STEAM JETS
Duriron Co., Inc., The, 488 N. Findlay St., Dayton, Ohio.

PIG IRON
Bethlehem (Pa.) Steel Company.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson (Ohio) Iron & Steel Co., The.
Jones & Laughlin Steel Corp., Pittsburgh.
Pickands Mather & Co., Cleveland.
Republic Steel Corp., Cleveland, Ohio.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Wisconsin Steel Co., Chicago, Ill.

PIG IRON—Charcoal
Oglebay, Norton & Co., Cleveland, Ohio.

PIG IRON CASTING PLANTS
Heyl & Patterson, Inc., Pittsburgh.

PILING—Steel Pipe
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PILING—Steel Sheet
American Rolling Mill Co., The, Middletown, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

PILLOW BLOCKS
Medart Co., The, St. Louis, Mo.

PINIONS—Rolling Mill
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Mesta Mch. Co., Pittsburgh.

PINIONS—Wire and Rod
Rathbone, A. R. & J., Palmer, Mass.

PINS—Cotter
Lamson & Sessions Co., The, Cleveland.

PIPE—Alloy
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PIPE—Cast Iron, B & S & Flanged
Wood, R. D., & Co., Philadelphia, Pa.

PIPE—Lead
National Lead Co., 111 Bdway., N. Y. C.

PIPE—Lead Lined
National Lead Co., 111 Bdway., N. Y. C.

PIPE—New and Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Greenpoint Iron & Pipe Co., Inc., 340 Stagg St., Bklyn., N. Y.

PIPE—Seamless Brass or Conner
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

PIPE—Seamless Steel
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PIPE—Spiral Welded
American Rolling Mill Co., The, Middletown, Ohio.

PIPE—Standard, Black and Galvanized
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Youngstown (Ohio) Sheet & Tube Co., The.
Wheeling (W. Va.) Steel Corp.

PIPE—Welded, Electric
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.

PIPE COVERING—Asbestos
Johns-Manville Corp., 22 East 40th St., New York City.

PIPE FITTINGS
Crane Co., Chicago.
Jarecki Mfg. Co., Erie, Pa.

PIPE THREADING & CUTTING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Cox & Sons Co., The, Bridgeton, N. J.
Jarecki Mfg. Co., Erie, Pa.
Landis, Mach. Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

PISTON RINGS
Koppers Co., American Hammered Piston Ring Div., Baltimore, Md.

PLANERS
Cincinnati (Ohio) Planer Co.
Ohio Machine Tool Co., Kenton, Ohio.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

PLANERS—Plate
Cleveland (Ohio) Punch & Shear Works Co., The.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

PLANERS—Rotary
Cleveland (Ohio) Punch & Shear Works Co., The.
Espen-Lucas Mch. Wks., Philadelphia.

PLANING MACHINES — Second Hand. (See Clearing House Section)

PLASTICS—Moulded
Continental-Diamond Fibre Co., Newark, Delaware.

PLATER'S CLEANING COMPOUND
American Chemical Paint Co., Ambler, Pa.

PLATES—Floor or Cellar Door
Alan Wood Steel Co., Conshohocken, Pa.

Products Index

Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Inland Steel Co., Chicago.

PLATES—Ground & Polished
Holliday, W. J., & Co., Hammond, Ind.

PLATES—Iron or Steel
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., The, Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Holliday, W. J., & Co., Hammond, Ind.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Ryerson, Joseph T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Wortn Steel Co., Claymont, Del.
Youngstown (Ohio) Sheet & Tube Co., The.

PLATES—Speed Case Steel
Holliday, W. J., & Co., Hammond, Ind.

PLATFORMS—Skid
Standard Pressed Steel Co., Jenkintown Pa.

PLATING—Cadmium
Meaker Co., The, Chicago, Ill.

PLATING—Chromium
United Chromium Incorporated, 51 East 42nd St., N. Y. C.

PLATING—Zinc
Meaker Co., The, Chicago, Ill.

PLATING EQUIPMENT—All Metals
Meaker Co., The, Chicago, Ill.

PLATING MATERIALS
Special Chemicals Corp., 32 Irving Place, New York City.

PLUGS—Core Hole
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.

POLISHING MACHINES—Bar
Medart Co., The, St. Louis, Mo.

POLISHING MACHINES—Sheet, Strip & Plate
Hill Acme Co., The, Cleveland, Ohio.

PORCELAIN ENAMEL
Hommel, O., Co., The, Pittsburgh, Pa.

POTS—Lead, Cyanide or Carbon
Electro Alloys Co., Elyria, Ohio.

POWER TRANSMITTING MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Dodge Mfg. Corp., Mishawaka, Ind.
Hill Acme Co., The, Cleveland, Ohio.

POWER UNITS—Rotary
Cushman Chuck Co., Hartford, Conn.
New Departure Div., General Motors Sales Corp., Bristol, Conn.

POWER UNITS—Straight Line
Cushman Chuck Co., Hartford, Conn.

PRECIPITATORS—Electrostatic Dust
Pangborn Corporation, Hagerstown, Md.

PRESS BRAKES — See Brakes — Metal Forming

PRESS FEEDS—Automatic
Cleveland (Ohio) Punch & Shear Works Co., The.
Littell, F. J., Mch. Co., Chicago.

PRESSED METAL PARTS
Budd, Edward G., Mfg. Co., Phila., Pa.
Champion Sheet Metal Co., Inc., cor. Squires & Duane Sts., Cortland, N. Y.
Davis Brake Beam Co., Laurel Ave. & A St., Johnstown, Pa.
New England Pressed Steel Co., Natick, Mass.
Stanley Works, The, New Britain, Conn.
Bridgeport, Conn.
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.

PRESSED STEEL PARTS
Budd, Edward G., Mfg. Co., Phila., Pa.
Crosby Co., The, Buffalo, N. Y.
Koch, George, Sons, Inc., Evansville, Ind.
Lansing (Mich.) Stamping Co., So. Penn Ave.
Parish Pressed Steel Co., Reading, Pa.
Stanley Works, The, New Britain, Conn.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

PRESSES—Automatic
Cleveland (Ohio) Punch & Shear Works Co., The.
Henry & Wright Mfg. Co., The, Hartford, Conn.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

PRESSES—Baling
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
McKay Machine Co., The, Youngstown, Ohio.

PRESSES—Briquetting—Metal Turnings
Milwaukee (Wis.) Foundry Equipment Co.

PRESSES—Broaching
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.

PRESSES—Coining
Cleveland (Ohio) Punch & Shear Works Co., The.
Farquhar, A. B., Co., Ltd., York, Pa.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Die Sinking
Farquhar, A. B., Co., Ltd., York, Pa.

PRESSES—Drawing
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Cleveland (Ohio) Punch & Shear Works Co., The.
Farquhar, A. B., Co., Ltd., York, Pa.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.

PRESSES—Drop—See Hammers—Drop

PRESSES—Embossing
Farquhar, A. B., Co., Ltd., York, Pa.

PRESSES—Extrusion
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Cleveland (Ohio) Punch & Shear Works Co., The.

PRESSES—Foot
Baird Mch. Co., The, Bridgeport, Conn.
Niagara Machine & Tool Works, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

PRESSES—Forging
Ajax Mfg. Co., The, Cleveland, Ohio.
Chambersburg (Pa.) Engineering Co.
Cleveland (Ohio) Punch & Shear Works Co., The.
Farquhar, A. B., Co., Ltd., York, Pa.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Forming and Bending
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co., The Steelweld Machry. Div., Wickliffe, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.
Dreis & Krump Mfg. Co., Chicago.
Farquhar, A. B., Co., Ltd., York, Pa.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

PRESSES—Friction Screw
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Hydraulic
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Chambersburg (Pa.) Engineering Co.
Denison Engineering Co., 108 W. Chestnut St., Columbus, Ohio.
Farquhar, A. B., Co., Ltd., York, Pa.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hannifin Mfg. Co., Chicago, Ill.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia, Pa.

PRESSES—Metal Extrusion
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Plastics Molding
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Power
Baird Mch. Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co., The Steelweld Machry. Div., Wickliffe, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.
Farrel-Birmingham Co., Inc., Ansonia Conn.
Hyman, Joseph, & Sons, Phila.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Machine & Tool Wks., Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
V & O Press Co., Hudson, N. Y.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Stamping
Cleveland (Ohio) Punch & Shear Works Co., The.
Farquhar, A. B., Co., Ltd., York, Pa.

PRESSES—Straightening
Farquhar, A. B., Co., Ltd., York, Pa.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.

PRESSES—Trimming
Chambersburg (Pa.) Engineering Co.
Cleveland (Ohio) Punch & Shear Works Co., The.
Erie (Pa.) Foundry Co.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

PROJECTORS—Contour Measuring
Jones & Lamson Machine Co., Springfield, Vt.

PULLEYS—Friction Clutch
Dodge Mfg. Corp., Mishawaka, Ind.

PULLEYS—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Ding Magnetic Separator Co., 728 Smith St., Milwaukee, Wis.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

PULLEYS—Solid & Split
Dodge Mfg. Corp., Mishawaka, Ind.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.

PULLEYS—V-Belt
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

PULVERIZED COAL SYSTEMS
Ameler-Morton Co., The, Pittsburgh, Pa.

PULVERIZERS
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Whiting Corp., Harvey, Ill.

PUMPS—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

PUMPS—Boiler Feed
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

PUMPS—Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago.
Ruthman Machinery Co., Cincinnati, Ohio.
Tomkins-Johnson Co., The, Jackson, Mich.

PUMPS—Coolant
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Roper, Geo. D., Corp., Rockford, Ill.
Ruthman Machinery Co., Cincinnati, Ohio.

PUMPS—Descaling
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

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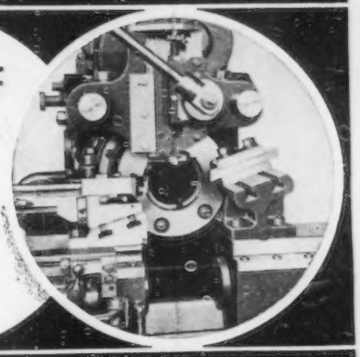

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Products Index

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Fairbanks, Morse & Co., Chicago.
Roper, Geo. D., Corp., Rockford, Ill.

PUMPS—Hydraulic
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Fairbanks, Morse & Co., Chicago.
Roper, Geo. D., Corp., Rockford, Ill.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PUMPS—Hydraulic—Radial—Variable Reversible Delivery
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.

PUMPS—Power
Fairbanks, Morse & Co., Chicago.
Roper, Geo. D., Corp., Rockford, Ill.

PUMPS—Power Transmission
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Roper, Geo. D., Corp., Rockford, Ill.

PUMPS—Rotary Positive.
Crane Co., Chicago.
Roots-Connersville Blower Corp., Connersville, Ind.
Roper, Geo. D., Corp., Rockford, Ill.

PUMPS—Steam
Fairbanks, Morse & Co., Chicago.

PUNCHES & DIES
Cleveland (Ohio) Punch & Shear Works Co., The.
Cleveland Steel Tool Co., The, 660 E. 82d St., Cleveland, Ohio.

PUNCHING AND SHEARING MACHINES
Bertsch & Co., Cambridge City, Ind.
Buffalo (N. Y.) Forge Co., 492 Broadway.
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Excelsior Tool & Mach. Co., E. St. Louis, Ill.
Niagara Machine & Tools Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

PYROMETERS—Indicating
Brown Instrument Co., The, Philadelphia, Pa.
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

RAILS
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Foster, L. B., Co., Inc., Pittsburgh.
Frank, M. K., 480 Lexington Ave., N. Y. C.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

RAILS—Relaying
Frank, M. K., 480 Lexington Ave., N. Y. C.
Hyman-Michaels Co., Chicago.
Iron & Steel Products, Inc., Chicago.
Sherwood, E. C., 50 Church St., N. Y. C.

RAILWAY EQUIPMENT & SUPPLIES
Fairbanks, Morse & Co., Chicago.
Iron & Steel Products, Inc., Chicago.

REAMERS
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Cleveland (Ohio) Twist Drill Co., The.
Gisholt Machine Co., Madison, Wisconsin.
Greenfield (Mass.) Tap & Die Corp.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

REAMERS—Expansion
Apex Machine & Tool Co., The, Dayton, Ohio.
Gairing Tool Co., The, Detroit.
Greenfield (Mass.) Tap & Die Corp.

REAMING MACHINES
Blanchard Machine Co., Cambridge, Mass.

RECORDERS—Furnace Atmosphere
Brown Instrument Co., The, Philadelphia, Pa.

REELS—For Coil Stock
Littell, F. J., Mch. Co., Chicago.

REFRACTORIES
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.
Carborundum Co., The, Perth Amboy N. J.
Illinois Clay Products Co., Joliet, Ill.
Norton Co., Worcester, Mass.

REFRACTORY LABORATORY WARE
Carborundum Co., The Perth Amboy, N. J.

REGULATORS—Compressed Gas
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

REINFORCEMENT FABRIC—Concrete
Pittsburgh (Pa.) Steel Co.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

RETORTS—Alloy
Electro Alloys Co., Elyria, Ohio.

RIDDLES—Foundry
Ludlow-Saylor Wire Co., St. Louis, Mo.

RINGS—Iron or Steel
Midvale Co., The, Nicetown, Phila., Pa.
Standard Steel Wks. Div. The Baldwin Locomotive Works, Phila., Pa.

RINGS—Welded
King Fifth Wheel Co., 5031 Beaumont Ave., Philadelphia.

RIVET MAKING MACHINERY
Hill Acme Co., The, Cleveland, Ohio.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

RIVET SETS
Cleveland (Ohio) Punch & Shear Works Co., The.
Cleveland Steel Tool Co., The, 660 E 82d St., Cleveland, Ohio.

RIVETING MACHINES
Hannifin Mfg. Co., Chicago, Ill.
Shuster, F. B., Co., The, New Haven, Ct.
Tomkins-Johnson Co., The, Jackson, Mich.

RIVETS
American Screw Co., Providence, R. I.
Clark Bros. Bolt Co., Milldale, Conn.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

ROCK BITS
Timken Roller Bearing Co., Canton, Ohio.

RODS—Aluminum
Aluminum Co. of America, Pittsburgh.

RODS—Brass
American Brass Co., The, Waterbury, Conn
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Titan Metal Mfg. Co., Bellefonte, Pa.

RODS—Drill
Kidd Drawn Steel Co., Aliquippa, Pa.

RODS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

RODS—Nickel Silver
American Brass Co., The, Waterbury, Conn.

RODS—Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

RODS—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

RODS—Welding
Air Reduction, 60 East 42nd St., N. Y. C.
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., The, Cleveland.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Pittsburgh (Pa.) Steel Co.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Titan Metal Mfg. Co., Bellefonte, Pa.
Una Welding, Inc., Cleveland, Ohio.

RODS—Welding, Hard Surfacing
Wall-Colmonoy Corp., Detroit, Mich.

RODS—Wire
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.
Youngstown (Ohio) Sheet & Tube Co., The.

ROLLER LEVELERS—Backed Up
McKay Machine Co., The, Youngstown, Ohio.

ROLLING MACHINERY—Cold Rolling
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

ROLLING MACHINERY—Sheet Metal
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.

ROLLING MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Farrel-Birmingham Co., Inc., Ansonia, Ct.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
McKay Machine Co., The, Youngstown, Ohio.
Mesta Mch. Co., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Fdry. Co., Avonmore, Pa.
Torrington (Conn.) Mfg. Co., The.
United Engineering & Fdry. Co., Ptgh.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

ROLLS—Alloy Steel
Continental Roll & Steel Foundry Co., East Chicago, Ind.
McKay Machine Co., The, Youngstown, Ohio.
Ohio Steel Foundry Co., Lima, Ohio.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh.

ROLLS—Bending and Straightening
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Bertsch & Co., Cambridge City, Ind.
Cleveland (Ohio) Punch & Shear Works Co., The.
McKay Machine Co., The, Youngstown, Ohio.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

ROLLS—Forging
Ajax Mfg. Co., The, Cleveland.

ROLLS—Rubber Covered
Castle Rubber Co., East Butler, Pa.
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

ROLLS—Sand Chilled Iron and Steel
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.

Products Index

Mackintosh-Hemphill Co., Pittsburgh
Mesta Mch. Co., Pittsburgh.
National Roll & Fdry. Co., Avonmore, Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

ROLLS—Special Hardened
Bethlehem (Pa.) Steel Company.
Midvale Co., The Nicetown, Phila., Pa.

ROOFING MATERIALS
Carey, Philip, Co., The, Cincinnati, Ohio.

ROOFING—Coal Tar Pitch
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

ROOFING—Special Copper Bearing Steel
Superior Sheet Steel Co., The, Canton, Ohio.

ROOFING—Steel Deck
Mahon, R. C., Co., Detroit, Mich.

ROOFING AND SIDING—Corrugated and Plain
American Rolling Mill Co., The, Middletown, O.
Carey, Philip, Co., The, Cincinnati, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Johns-Manville Corp., 22 East 40th St., New York City.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.

ROOFING AND SIDING—Iron and Steel
Inland Steel Co., Chicago.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.

ROOFING & SIDING—(Zinc)—Corrugated & Plain
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

ROTARY MILLING MACHINES
National Broach & Machine Co., Detroit, Mich.

ROTARY SHAVING MACHINES
National Broach & Machine Co., Detroit, Mich.

RUBBER MOLDED PARTS
Manhattan Rubber Mfg. Div. of Raybestos-Manhatten, Inc., The, 2 Towsend St., Passaic, N. J.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

RUST PROOFING COMPOUNDS
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

RUST PROOFING MACHINES
Mahon, R. C., Co., Detroit, Mich.

RUST PROOFING PROCESS
American Chemical Paint Co., Ambler, Pa.
Enterprise Galvanizing Co., Philadelphia.
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.
Southern Galvanizing Co., Baltimore, Md.

SALT TABLETS
Morton Salt Co., Chicago, Ill.

SAND BLAST EQUIPMENT & MACHINES
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.

SAND BLAST STEEL SHOT
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Harrison Abrasive Corp., Manchester, N. H.
Pangborn Corporation, Hagerstown, Md.
Pittsburgh (Pa.) Crushed Steel Co.

SAND HANDLING EQUIPMENT
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

SAWING MACHINES—Metal
Armstrong-Blum Mfg. Co., Chicago, Ill.
Espen-Lucas Mch. Works, Phila.
Peerless Machine Co., 1613 Junction Ave., Racine, Wis.

SAWING MACHINES—Metal—Band
Armstrong-Blum Mfg. Co., Chicago, Ill.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.
DoAll Saw Co. Div. of Continental Machines, Inc., Des Plaines, Ill.

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.
Disston, Henry, & Sons, Inc., Philadelphia.
DoAll Saw Co. Div. of Continental Machines, Inc., Des Plaines, Ill.

SAWS—Circular, Rip & Cutoff
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Peerless Machine Co., 1613 Junction Ave., Racine, Wis.

SAWS—Friction
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Hack Saw Blades
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.
Millers Falls Co., Greenfield, Mass.
Peerless Machine Co., 1613 Junction Ave., Racine, Wis.

SAWS—Hot Metal
Ajax Mfg. Co., The, Cleveland.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Inserted Tooth, Cold
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.
Tabor Mfg. Co., Philadelphia.

SAWS—Milling
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.

SAWS—Slotting
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Greenfield (Mass.) Tap & Die Corp.
Peerless Machine Co., 1613 Junction Ave., Racine, Wis.

SCALES
Fairbanks, Morse & Co., Chicago.
Streeter-Amet Co., Chicago.
Toledo (Ohio) Scale Co.

SCRAP BALERS—See Presses—Baling

SCRAP BUNDLING MACHINES
Cox & Sons Co., The, Bridgeton, N. J.

SCREENS—Foundry Sand
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

SCREENS—Foundry Shakeout
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

SCREENS—Perforated Metal
Chicago Perforating Co., 2440 W. 24th Place, Chicago, Ill.
Diamond Mfg. Co., Wyoming, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., The, Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

SCREENS—Woven Wire
Ludlow-Saylor Wire Co., St. Louis, Mo.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

SCREW DRIVER BITS—Recessed Head Type
Apex Machine & Tool Co., The, Dayton, Ohio.

SCREW DRIVERS—Ratchet & Spiral
North Bros. Mfg. Co., Philadelphia, Pa.

SCREW DRIVERS—Recessed Head
North Bros. Mfg. Co., Philadelphia, Pa.

SCREW DRIVERS—Recessed Head Type
Apex Machine & Tool Co., The, Dayton, Ohio.

SCREW MACHINE PRODUCTS
Blake & Johnson Co., The, Waterville, Conn.
Chase Brass & Copper Co., Inc., 40 Roland St., Waterbury, Conn.
Commonwealth Brass Corp., Detroit.
Continental-Diamond Fibre Co., Newark, Delaware.
Defiance Screw Machine Prods Div. of The Serrick Corp., Defiance, Ohio.
Eastern Mch. Screw Corp., New Haven, Ct.
Mid-West Screw Products Co., 20 St. George St., St. Louis, Mo.
Miles, Franklin S., 2422-28 N. Masher St., Phila., Pa.
National Acme Co., The, Cleveland.
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.
Olson Mfg. Co., Worcester, Mass.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Peck Spring Co., The, Plainville, Conn.
R & L Tools, Philadelphia, Pa.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.

SCREW MACHINERY—Automatic
Brown & Sharpe Mfg. Co., Providence R. I.
Cleveland (Ohio) Automatic Machine Co., The
Cone Automatic Machine Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

SCREW MACHINERY—Hand
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., The, Cleveland.

SCREW MACHINERY—Multiple Spindle
Acme Machine Tool Co., The, Cincinnati, Ohio.
Cleveland (Ohio) Automatic Machine Co., The
Cone Automatic Machine Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREW PLATES
Greenfield (Mass.) Tap & Die Corp.

SCREW STOCK
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis Ind.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SCREWS—Cap
Cleveland (Ohio) Cap Screw Co., The.
Lamson & Sessions Co., The, Cleveland.
Mid-West Screw Products Co., 20 St. George St., St. Louis, Mo.
National Acme Co., The, Cleveland
Ottemiller, Wm. H., Co., Inc., York, Pa.
Trinlex Screw Co., Cleveland.

SCREWS—Coach or Lag
Lamson & Sessions Co., The, Cleveland.

SCREWS—For Sheet Metal
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS—Hardened Metallic Drive
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS—Locking
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.

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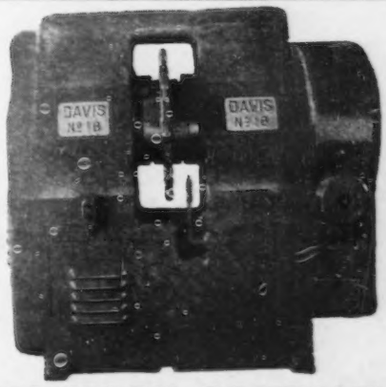

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Products Index

SCREWS—Machine
Blake & Johnson Co., The, Waterville, Conn.
Lamson & Sessions Co., The, Cleveland.
Progressive Mfg. Co., The, Torrington, Ct.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
Triplex Screw Co., Cleveland.

SCREWS—Machine, Recessed Head
American Screw Co., Providence, R. I.

SCREWS—Safety Set
Parker-Kalon Corp., 200 Varick St., N. Y. C.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Set
Cleveland (Ohio) Cap Screw Co., The.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.

SCREWS—Sheet Metal Recessed Head
American Screw Co., Providence, R. I.

SCREWS, Socket Head Cap
Parker-Kalon Corp., 200 Varick St., N. Y. C.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Thread Cutting
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.

SCREWS—Wood, Recessed Head
American Screw Co., Providence, R. I.

SCRIBERS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

SCRUBBING MACHINES—Sheet
Wean Engineering Co., Inc., The, Warren, Ohio.

SECOND - HAND MACHINERY—(See Clearing House Section)

SEPARATORS—Magnetic
Ding Magnetic Separator Co., 728 Smith St., Milwaukee.
Ohio Electric Mfg. Co., The, 5908 Maurice Ave., Cleveland.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

SHAFTING—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Holliday, W. J., & Co., Hammond, Ind.
LaSalle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wisconsin Steel Co., Chicago, Ill.
Wyckoff Drawn Steel Co., Pittsburgh.

SHAFTING—Steel
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SHAFTING—Turned and Ground
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Copperweld Steel Co., Warren, Ohio.
Holliday, W. J., & Co., Hammond, Ind.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., Chicago.
Union Drawn Steel Div. Republic Stee Corp., Massillon, Ohio.
Wisconsin Steel Co., Chicago, Ill.
Wyckoff Drawn Steel Co., Pittsburgh.

SHAPERS
Cincinnati (Ohio) Shaper Co., The.
Hendey Machine Co., Torrington, Conn.
Ohio Machine Tool Co., Kenton, Ohio.

SHAPERS—Vertical
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

SHAPES—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

SHARPENING STONES
Carborundum Co., The Niagara Falls, N. Y.

SHEAR BLADES & KNIVES
American Shear Knife Co., Homestead, Pa.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Canton Foundry & Mch. Co., The, Div. of The Hill Acme Co., 6400 Breakwater Ave., Cleveland, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.
Hoppenstall Co., Pittsburgh, Pa.

SHEARING MACHINES—Alligator
Canton Foundry & Mch. Co., The, Div. of The Hill Acme Co., 6400 Breakwater Ave., Cleveland, Ohio.

SHEARING MACHINES—Angle, Hand and Power
Cleveland (Ohio) Punch & Shear Works Co., The.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y

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Buffalo (N. Y.) Forge Co., 492 Broadway.
Cleveland (Ohio) Punch & Shear Works Co., The.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES — Beam and Channel
Cleveland (Ohio) Punch & Shear Works Co., The.
Schatz Mfg. Co., The, Poughkeepsie, N. Y
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES—Billet
Morgan Engineering Co., The, Alliance, O.
Schatz Mfg. Co., The, Poughkeepsie, N. Y
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES — Continuous Sheet & Pack
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.

SHEARING MACHINES—Plate
Bertsch & Co., Cambridge City, Ind.
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES — Sheet and Plate
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

SHEARING MACHINES—Squaring
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

SHEARING MACHINES—Up Cut
McKay Machine Co., The, Youngstown, Ohio.

SHEET BARS
Andrews Steel Co., The, Newport, Ky.

SHEET LIFTERS
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.

SHEET METAL MACHINERY
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Dreis & Krump Mfg. Co., Chicago.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
V & O Press Co., Hudson, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

SHEET METAL WORK
Thames Sheet Metal Works, Inc., New London, Conn.

SHEETS—Aluminum
Aluminum Co. of America, Pittsburgh.

SHEETS—Auto Body
American Rolling Mill Co., The, Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Inland Steel Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Youngstown (Ohio) Sheet & Tube Co., The.

SHEETS—Black
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Granite City (Ill.) Steel Co.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos., T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.

SHEETS—Blue Annealed
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., The, Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Worth Steel Co., Claymont, Del.

SHEETS—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

SHEETS—Chrome
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SHEETS—Chrome Nickel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SHEETS—Cold Rolled
American Rolling Mill Co., The, Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Ecorse, Detroit.
Holliday, W. J., & Co., Hammond, Ind.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos., T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Copper Alloy
American Brass Co., The, Waterbury, Conn.

SHEETS—Copper Steel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

Products Index

Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Wheeling (W. Va.) Steel Corp.

SHEETS—Electrical
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Enameling
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago, Ill.

SHEETS—For Drawing and Stamping
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Superior Sheet Steel Co., The, Canton, Ohio.
Worth Steel Co., Claymont, Del.

SHEETS—Full Finished
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Galvanized, Flat and Corrugated
American Rolling Mill Co., The, Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Holliday, W. J., & Co., Hammond, Ind.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Superior Sheet Steel Co., The, Canton, Ohio.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

SHEETS—Galvannealed
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Superior Sheet Steel Co., The, Canton, Ohio.

SHEETS—Hot Rolled
Holliday, W. J., & Co., Hammond, Ind.
Superior Sheet Steel Co., The, Canton, Ohio.

SHEETS—Hot Rolled Pickled
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Superior Sheet Steel Co., The, Canton, Ohio.

SHEETS—Lead
National Lead Co., 111 Bdway., N. Y. C.

SHEETS—Long Terne
American Rolling Mill Co., The, Middletown, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Superior Sheet Steel Co., The, Canton, Ohio.

SHEETS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

SHEETS—Metal Furniture
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Tin Mill Black
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.

SHEETS—Zinc
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

SHOP FURNITURE
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

SHOVELS—Gasoline
Marion (Ohio) Steam Shovel Co.

SHOVELS—Mounted—See Cranes

SHOVELS—Steam
Marion (Ohio) Steam Shovel Co.

SHUTTERS—Steel & Wood Bi-Folding
Kinnear Mfg. Co., Columbus, Ohio.

SILICO—MANGANESE
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SILICON METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SINE BARS
Ford Motor Co. (C. E. Johansson Div.) Dearborn, Mich.

SLABS
Andrews Steel Co., The, Newport, Ky.

SLINGS—Wire Rope
Macwhyte Co., Kenosha, Wisc.
Roebling's, John A., Sons Co., Trenton, N. J.

SLITTERS—Gang
McKay Machine Co., The, Youngstown, Ohio.

SLOTTERS
Lobdell Car Wheel Co., Nazel Hammer Div., Wilmington, Del.

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Bullard Co., The, Bridgeport, Conn.
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Coulter, James, Machine Co., The, Bridgeport, Conn.
Davis & Thompson Co., Milwaukee, Wis.
Denison Engineering Co., The, 108 W. Chestnut St., Columbus, Ohio.
Diamond Iron Works, Inc., Minneapolis, Minn.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Hartford (Conn.) Special Machinery Co., The.
Morgan Engineering Co., The, Alliance, O.
Munson Mill Machinery Co., Utica, N. Y.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Ohio Machine Tool Co., Kenton, Ohio.
Sprout, Waldron & Co., 1400 Sherman St., Muncy, Pa.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.
Torrington (Conn.) Mfg. Co., The.
Weatherly (Pa.) Foundry & Mfg. Co.
Whiting Corp., Harvey, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

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Twin Disc Clutch Co., Racine, Wis.

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Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
New Jersey Zinc Co., The, 160 Front St., New York City.

SPIKES—Track
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.

SPINDLES—Boring
Cimatool Co., The, Dayton, Ohio.

SPINDLES—Grinding
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

SPINDLES—Hollow Bored
American Hollow Boring Co., 1912 Raspberry St., Erie, Pa.

SPINNINGS—Aluminum
American Aluminum Ware Co., 372 Jelliff Ave., Newark, N. J.

SPLICE BARS
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SPRAY BOOTHS—Paint
Mahon, R. C., Co., Detroit, Mich.

SPRING MAKING MACHINERY
Baird Mch. Co., The, Bridgeport, Conn.
Torrington (Conn.) Mfg. Co., The.

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American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Cook Plant of Barnes-Gibson-Raymond, Div. of Associated Spring Corp., Ann Arbor, Mich.
Cuyahoga Spring Co., The, Cleveland.
Dunbar Bros. Co., Div. of Associated Spring Corp., Bristol, Conn.
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. of Associated Spring Corp., Corry, Pa.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

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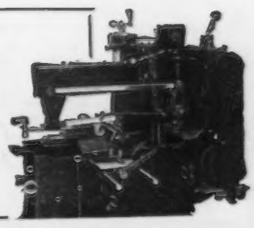

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140 CEDAR STREET, NEW YORK, N. Y.

STEEL PRODUCTION

DESIGN · OPERATION · CONSTRUCTION · METALLURGY

Products Index

SPROCKETS
Morse Chain Co., Ithaca, N. Y.
Whitney Chain & Mfg. Co., Hartford, Ct.

STAMPINGS—Non-Metallic
Continental-Diamond Fibre Co., Newark, Delaware.

STAMPINGS & DRAWINGS—Aluminum
American Aluminum Ware Co., 372 Jelliff Ave., Newark, N. J.

STAMPINGS OR DRAWINGS—Metal
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Budd, Edward G., Mfg. Co., Phila., Pa.
Champion Sheet Metal Co., Inc., cor. Squires & Duane Sts., Cortland, N. Y.
Chase Brass & Copper Co., Inc., 40 Roland St., Waterbury, Conn.
Cook Plant of Barnes-Gibson-Raymond, Div. of Associated Spring Corp., Ann Arbor, Mich.
Crosby Co., The, Buffalo, N. Y.
Dunbar Bros. Co., Div. of Associated Spring Corp., Bristol, Conn.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass.
Greist Mfg. Co., The, 646 Blake St., New Haven, Conn.
Heintz Mfg. Co., Philadelphia, Pa.
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Lansing (Mich.) Stamping Co., So. Penn. Ave.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Matthews Mfg. Co., 89 Hermon St., Worcester, Mass.
New England Pressed Steel Co., Natick, Mass.
Parish Pressed Steel Co., Reading, Pa.
Raymond Mfg. Co., Div. of Associated Spring Corp., Corry, Pa.
Sessions, J. H., & Son, Hooker Court, Bristol, Conn.
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.
Stanley Works, The, New Britain, Conn.
Torrington (Conn.) Company
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

STAMPS—Steel
Cunningham, M. E., Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.

STAPLES—Wire
Wickwire Brothers, Cortland, N. Y.

STARTERS—Motor
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

STEEL—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

STEEL—Alloy
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Harrisburg (Pa.) Steel Corp.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.
Jessop Steel Co., Washington, Pa.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Youngstown (Ohio) Sheet & Tube Co., The.

STEEL—Alloy, Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Bright Finished
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

STEEL—Carbon
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.

STEEL—Case Hardening
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Monarch Steel Co., Indianapolis, Ind.

STEEL—Chrome
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Molybdenum
Copperweld Steel Co., Warren, Ohio.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Nickel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Copperweld Steel Co., Warren, Ohio.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Dubera Corp., 11 Broadway, N. Y. C.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Nickel Silver
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.

STEEL—Cobalt
Darwin & Milner, Inc., Cleveland.

STEEL—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
Kidd Drawn Steel Co., Aliquippa, Pa.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Rathbone, A. B. & J., Palmer, Mass.
Ryerson, Joseph T., & Son, Inc., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Cold Rolled Strip
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Company.
Griffin Mfg. Co., Erie, Pa.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Superior Steel Corp., Carnegie, Pa.
Thomas Steel Co., The, Warren, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wisconsin Steel Co., Chicago, Ill.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.

STEEL—Cold Rolled Strip—Electro Brass Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Electro Copper Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Electro-Galvanized Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Electro Tin Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Electro Zinc Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Griffin Mfg. Co., Erie, Pa.

STEEL—Composite Tool & Die
Jessop Steel Co., Washington, Pa.

STEEL—Corrosion Resisting
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Latrobe (Pa.) Electric Steel Co.
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.
Superior Steel Corp., Carnegie, Pa.

STEEL—Crucible
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Cutlery
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Latrobe (Pa.) Electric Steel Co.

STEEL—Die
Allegheny Ludlum Steel Corp., Pittsburgh Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Disston, Henry, & Sons, Inc., Philadelphia.
Jessop, Wm., & Sons, Inc., 627-29 Sixth Ave., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Drill
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.

STEEL—Electric
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Copperweld Steel Co., Warren, Ohio.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Disston, Henry, & Sons, Inc., Philadelphia.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Forging
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Midvale Co., The, Nicetown, Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Free Cutting
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Hack Saw
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Hardening
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—High Speed
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Hot Rolled Strip
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Superior Steel Corp., Carnegie, Pa.
Thomas Steel Co., The, Warren, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wisconsin Steel Co., Chicago, Ill.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.

STEEL—Hot Rolled Strip, Pickled
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Thomas Steel Co., The, Warren, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wisconsin Steel Co., Chicago, Ill.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.

STEEL—Ingot Iron
Armco Ingot Iron Sales Co., Middletown, Ohio.
Wheeling Steel Corp., Wheeling, W. Va.

STEEL—Mechanical Tubing
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Thomas Steel Co., The, Warren, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wisconsin Steel Co., Chicago, Ill.

STEEL—Open Hearth
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Harrisburg (Pa.) Steel Corp.
Jessop Steel Co., Washington, Pa.
Republic Steel Corp., Cleveland, Ohio.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Youngstown (Ohio) Sheet & Tube Co., The.

STEEL—Rail
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

STEEL—Rerolling
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Shafting
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Sheet
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Superior Steel Corp., Carnegie, Pa.
Thomas Steel Co., The, Warren, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wisconsin Steel Co., Chicago, Ill.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.

STEEL—Silicon
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Spring
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Structural
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Harrisburg (Pa.) Steel Corp.
Jessop Steel Co., Washington, Pa.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Youngstown (Ohio) Sheet & Tube Co., The.

STEEL—Tank Plate
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Harrisburg (Pa.) Steel Corp.
Jessop Steel Co., Washington, Pa.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Youngstown (Ohio) Sheet & Tube Co., The.

STEEL—Tire
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

STEEL—Tool
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Tool, Hot Work
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Tool, Oil Hardening
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Tool, Shock Resisting
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Tool, Water Hardening
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Tungsten
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Vanadium
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Vacuum Melted
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.

STEEL—Welding Rod
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Wire
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Wire, Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
Kidd Drawn Steel Co., Aliquippa, Pa.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Rathbone, A. B. & J., Palmer, Mass.
Ryerson, Joseph T., & Son, Inc., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Wire, Cold Rolled Strip
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Company.
Griffin Mfg. Co., Erie, Pa.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Superior Steel Corp., Carnegie, Pa.
Thomas Steel Co., The, Warren, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wisconsin Steel Co., Chicago, Ill.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.

STEEL—Wire, Electro Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Wire, Hot Rolled Strip
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Superior Steel Corp., Carnegie, Pa.
Thomas Steel Co., The, Warren, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wisconsin Steel Co., Chicago, Ill.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.

STEEL—Wire, Hot Rolled Strip, Pickled
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Thomas Steel Co., The, Warren, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wisconsin Steel Co., Chicago, Ill.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.

STEEL—Wire, Spring
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Wire, Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Wire, Tool
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Wire, Tool, Oil Hardening
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Wire, Tool, Water Hardening
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Wire, Tungsten
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Wire, Vanadium
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Wire, Welding Rod
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Wire, Welding Rod, Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe,

Products Index

STEEL—High Speed
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Cleveland (Ohio) Twist Drill Co., The.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Dubera Corp., 11 Broadway, N. Y. C.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.
Jessop Steel Co., Washington, Pa.
Latrobe (Pa.) Electric Steel Co.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Hot Rolled Strip
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Great Lakes Steel Corp., Ecorse, Detroit.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Laclede Steel Co., St. Louis, Mo.
Republic Steel Corp., Cleveland, Ohio.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn., Bridgeport, Conn.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Superior Steel Corp., Carnegie, Pa.

STEEL—Magnet
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Latrobe (Pa.) Electric Steel Co.

STEEL—Open Hearth
Andrews Steel Co., The, Newport, Ky.
Pittsburgh (Pa.) Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Rustless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Griffin Mfg. Co., Erie, Pa.
Latrobe (Pa.) Electric Steel Co.
Rustless Iron & Steel Corp., Baltimore, Md.

STEEL—Screw
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Special Analysis
Allegheny Ludlum Steel Corp., Pittsburgh Pa.
Andrews Steel Co., The, Newport, Ky.
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Copperweld Steel Co., Warren, Ohio.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Harrisburg (Pa.) Steel Corp.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Spring
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Youngstown (Ohio) Sheet & Tube Co. The.

STEEL-Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Disston, Henry, & Sons, Inc., Philadelphia
Holliday, W. J., & Co., Hammond, Ind.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Rustless Iron & Steel Corp., Baltimore, Md.
Ryerson, Jos. T., & Son, Inc., Chicago
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Stainless Clad
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.
Jessop Steel Co., Washington, Pa.

STEEL—Tool
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carpenter Steel Co., The, 121 W. Bern St., Reading, Pa.
Copperweld Steel Co., Warren, Ohio.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Darwin & Milner, Inc., Cleveland.
Disston, Henry, & Sons, Inc., Philadelphia.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.
Jessop Steel Co., Washington, Pa.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Kidd Drawn Steel Co., Alquippa, Pa.
Latrobe (Pa.) Electric Steel Co.
Mauvais Co., The, Nicetown, Phila., Pa.
Ryerson, Jos., T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL MILL EQUIPMENT
Wellman Engineering Co., The, Cleveland

STEEL PLANTS AND ROLLING MILLS
Brassert, H. A., & Co., Pittsburgh, Pa.

STEEL ROLLS
Continental Roll & Steel Foundry Co., East Chicago, Ind.
United Engineering & Fdry. Co., Pitgh.

STOKERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.
Whiting Corp., Harvey, Ill.

STOPPERS—Neoprene
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

STOPPERS—Rubber
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

STOVES—Hot Blast
McKee, Arthur G., & Co., Cleveland.

STRAIGHT EDGES
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

STRAIGHTENING AND DRAWING MACHINES—For Bars
Ajax Mfg. Co., The, Cleveland.

STRAIGHTENING MACHINES—Bar & Tube
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Medart Co., The, St. Louis, Mo.

STRAIGHTENING MACHINES—Wire
Lewis Machine Co., 3455 E. 76th St., Cleveland.
Shuster, F. B., Co., The, New Haven, Conn.

STRUCTURAL IRON AND STEEL WORK
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Bethlehem (Pa.) Steel Company.
Mahon, R. C., Co., Detroit, Mich.
Morgan Engineering Co., The, Alliance, O.

STRUCTURAL STEEL — See Angles, Beams, Channels and Tees

STUDS
Erie (Pa.) Bolt & Nut Co.

SUMPS—Roof
Mahon, R. C., Co., Detroit, Mich.

SUPERHEATERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

SWAGING MACHINES
Etna Machine Co., The, Toledo, Ohio.
Torrington (Conn.) Company.

SWEEPERS—Floor, Power
Ideal Power Lawn Mower Co., 452 Kalamazoo St., Lansing, Mich.

SWITCHBOARDS AND SWITCHGEAR—Electric
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

SWITCHES—Electric
Westinghouse Elec. & Mfg. Co., East Pgh.

TANK LININGS
Cellcote Co., The, Cleveland, Ohio.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

TANK LININGS—Rubber
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

TANKS—Alkali Cleaning
Detroit Rex Products Co., Detroit, Mich.

TANKS—Compressed Air, Gas, Oil and Water
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

TANKS—Iron and Steel
Koppers Co., Bartlett Hayward Div., Baltimore, Md.

TANKS—Pickling
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
Hauser-Stander Tank Co., Cincinnati, Ohio.
Haveg Corp., Newark, Delaware.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

TANKS—Rubber Lined
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Towsend St., Passaic, N. J.

TANKS—Welded
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

TAPPING MACHINES
Hill Acme Co., The, Cleveland, Ohio.
Waterbury (Conn.) Farrel Fdry. & Mch. Co.

TAPS—Collapsing
Geometric Tool Co., The, New Haven, Conn.
Landis Mach. Co., Inc., Waynesboro, Pa.
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Products Index

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Landis Mch. Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

TEES—See Angles, Beams, Channels and Tees

TEMPERATURE—Determining Pellets
Tempil Corp., The, 132 W. 22nd St., New York City.

TERMINALS—Plain & Lock
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago.

TERNE PLATES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

TESTING MACHINES—Hardness
Shore Instrument & Mfg. Co., Inc., The, Jamaica, L. I., N. Y.

TESTING MACHINES—Materials
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.

THERMOMETERS—Recording
Brown Instrument Co., The, Philadelphia, Pa.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

THREAD CUTTING TOOLS—See Dies, Taps

THREAD ROLLING MACHINES
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

THREADING MACHINES
Eastern Mesh. Screw Corp., New Haven, Conn.
Geometric Tool Co., The, New Haven, Conn.
Hill Acme Co., The, Cleveland, Ohio.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit.

THREADING MACHINES—Automatic
Landis Mch. Co., Inc., Waynesboro, Pa.

THREADS—Ground
Hartford (Conn.) Special Machinery Co., The.

TIE PLATES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.

TIN PLATE
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Weirton (W. Va.) Steel Co.
Wheeling (W. Va.) Steel Corp.
Youngstown (Ohio) Sheet & Tube Co., The.

TIN PLATE MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Wean Engineering Co., Inc., The, Warren, Ohio.

TINNING EQUIPMENT—Sheets
Wean Engineering Co., Inc., The, Warren, Ohio.

TIPS—Spot Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

TONGS—Automatic
Heppenstall Co., Pittsburgh, Pa.

TOOL BIT TIPS—Hard Carbide
Carboloy Co., Inc., 11153 East 8-Mile Rd., Detroit, Mich.
McKenna Metals Co., Latrobe, Pa.

TOOL BITS
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit.
Gairing Tool Co., The, Detroit.
Gisholt Machine Co., Madison, Wisconsin.

TOOL HOLDERS
Armstrong Bros. Tool Co., Chicago.
Gairing Tool Co., The, Detroit.
Gisholt Machine Co., Madison, Wisconsin.
Jones & Lamson Machine Co., Springfield, Vt.
Williams, J. H., & Co., Buffalo, N. Y

TOOLS—Hard Carbide Tipped
McKenna Metals Co., Latrobe, Pa.

TOOLS—Lathe
Armstrong Bros. Tool Co., Chicago.
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit.
Gisholt Machine Co., Madison, Wisconsin.
Jones & Lamson Machine Co., Springfield, Vt.

TOOLS—Metal Cutting
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit.
Greenfield (Mass.) Tap & Die Corp.
Michigan Tool Co., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
R & L Tools, Philadelphia, Pa.

TOOLS—Special
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.

TOOLS—Steel Cutting
Carboloy Co., Inc., 11153 East 8-Mile Rd., Detroit, Mich.
McKenna Metals Co., Latrobe, Pa.

TOOLS—Tungsten Carbide
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit.

TOOLS—Turning For Automatics
R & L Tools, Philadelphia, Pa.

TORCHES—Brazing, Cutting and Welding
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.
Weldit Acetylene Co., Detroit, Mich.

TORQUE CONVERTERS
Twin Disc Clutch Co., Racine, Wis.

TRACTORS—Gasoline, Industrial
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

TRAILERS — Industrial — See Trucks, and Trailers—Industrial

TRAMRAILS—Overhead Systems
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

TRAMWAYS—Wire Rope
Leschen, A., & Sons Rope Co., St. Louis, Mo.
Macwhyte Co., Kenosha, Wisc.

TRANSFORMERS—Electric
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

TRANSMISSIONS—Hydraulic
American Engineering Co., Philadelphia
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

TRANSMISSIONS—Variable Speed
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.
Link-Belt Co., 2045 West Hunting Park Ave., Phila., Pa.
Reeves Pulley Co., Columbus, Indiana.

TRAPS—Steam
Crane Co., Chicago, Ill.
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.

TREADS—Safety
Blaw-Knox Div. of Blaw-Knox Co., Blawnox, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Kerlow Steel Flooring Co., Jersey City, N. J.
Norton Co., Worcester, Mass.

TROLLEYS
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

TRUCKS—Dump, Industrial
Atlas Car & Mfg. Co., The, Cleveland, Ohio.

TRUCKS—Elevating (Power)
Atlas Car & Mfg. Co., The, Cleveland, Ohio.
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TRUCKS—Foundry Core
Chicago (Ill.) Mfg. & Distributing Co.

TRUCKS—Lift (Hand & Foot)
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TRUCKS AND TRAILERS—Industrial
Baker-Raulang Co., The, 2175 W. 25 St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.
Ohio Galvanizing & Mfg. Co., The, Niles, Ohio.
Yale & Towne Mfg. Co., The, Phila., Div., Phila., Pa.

TUBE GRINDING & POLISHING
Monarch Steel Co., Indianapolis, Ind.

TUBE MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., Pgh.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

TUBE MILL MACHINERY—Welded
McKay Machine Co., The, Youngstown, Ohio.

TUBES—Boiler
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.

TUBES—Centrifugally Cast, Stainless
Duraloy Co., The, Scottdale, Pa.

TUBES—Copper Alloy
American Brass Co., The, Waterbury, Conn.

TUBES—High Carbon
Steel & Tubes Div. of Republic Steel Corp., Cleveland.

TUBES—Nickel Silver
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

TUBES—Stainless Steel
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Ryerson, Jos., T., & Son, Inc., Chicago.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.

TUBING—Aluminum Seamless
Aluminum Co. of America, Pittsburgh.

TUBING—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

TUBING—Nichrome
Steel & Tubes Div. of Republic Steel Corp., Cleveland.

Products Index

TUBING—Open Seam
Steel & Tubes Div. of Republic Steel Corp., Cleveland.

TUBING—Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

TUBING—Seamless Steel
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Ohio Seamless Tube Co., The, Shelby, Ohio.
Pittsburgh (Pa.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Youngstown (Ohio) Sheet & Tube Co., The.

TUBING—Square and Rectangular
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.

TUBING—Stainless Steel
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.

TUBING—Tinned Brass or Copper
Bundy Tubing Co., Detroit, Mich.

TUBING—Tinned-Steel
Bundy Tubing Co., Detroit, Mich.

TUBING—Welded Steel
Bundy Tubing Co., Detroit, Mich.
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Ohio Seamless Tube Co., The, Shelby, Ohio.
Standard Tube Co., The, Detroit, Mich.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Youngstown (Ohio) Sheet & Tube Co., The.

TUBULAR PRODUCTS
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Swan Engineering Co., Inc., Newark, N. J.

TUMBLING BARRELS—See Barrels—Tumbling

TUNGSTEN METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

TUNGSTEN CARBIDE
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit.
Firth-Sterling Steel Co., McKeesport, Pa.

TURBINE-GENERATORS—Steam
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURNING MACHINES—Bar & Tube
Medart Co., The, St. Louis, Mo.

TURNTABLES
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Atlas Car & Mfg. Co., The, Cleveland, Ohio.

TURNTABLES—Industrial
Atlas Car & Mfg. Co., The, Cleveland, Ohio.
Canton Foundry & Mch. Co., The, Div. of The Hill Acme Co., 6400 Breakwater Ave., Cleveland, Ohio.
Whiting Corp., Harvey, Ill.

TWIST DRILLS
Cleveland (Ohio) Twist Drill Co., The.
Greenfield (Mass.) Tap & Die Corp.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

UNCOILERS—Processing
Cleveland (Ohio) Punch & Shear Works Co., The.
McKay Machine Co., The, Youngstown, Ohio.

UNIONS
Crane Co., Chicago.

UNIT HEATERS—Electric
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.

VALVES—Acid Resisting
Crane Co., Chicago, Ill.
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.
National Lead Co., 111 Bdway., N. Y. C.

VALVES—Air Blast for Presses
Littell, F. J., Mch. Co., Chicago.

VALVES—Air & Hydraulic Control
Brown Instrument Co., The, Philadelphia, Pa.
Crane Co., Chicago, Ill.
Hannifin Mfg. Co., Chicago, Ill.
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.
Tomkins-Johnson Co., The, Jackson, Mich.
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

VALVES—Blow Air
Chicago (Ill.) Mfg. & Distributing Co.

VALVES—Gas, Water and Steam
Brown Instrument Co., The, Philadelphia, Pa.
Crane Co., Chicago.
Jarecki Mfg. Co., Erie, Pa.
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Wood, R. D., & Co., Philadelphia, Pa.

VALVES—Hydraulic
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Crane Co., Chicago.
Denison Engineering Co., 108 W. Chestnut St., Columbus, Ohio.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee, Wis.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.
Wood, R. D., & Co., Philadelphia, Pa.

VALVES—Proportioning
Brown Instrument Co., The, Philadelphia, Pa.

VALVES—Pump, Rubber
Garlock Packing Co., The, Palmyra, N. Y.

VANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

VIBRATORS
Milwaukee (Wis.) Foundry Equipment Co.

VISES
Cincinnati (Ohio) Milling Mch. Co., The.
Jarecki Mfg. Co., Erie, Pa.
North Bros. Mfg. Co., Philadelphia, Pa.

VISES—Machine
Hendey Machine Co., Torrington, Conn.

WASHERS—Bevel Steel
Nicetown Plate Washer Co., Inc., Philadelphia.

WASHERS—Iron or Steel
Nicetown Plate Washer Co., Inc., Philadelphia.
Sessions, J. H., & Son, Hooker Court, Bristol, Conn.
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.
Smith, Thomas, Co., Worcester, Mass.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.

WASHERS—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

WASHERS—Lock
American Nut & Bolt Fastener Co., Pittsburgh.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, Ohio.
Eaton Mfg. Co., Massillon, Ohio.
Kantlink Spring Washers, 616 Wrigley Bldg., Chicago, Ill.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., The, Newark, N. J.
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago.
Washburn Co., The, Worcester, Mass.

WASHERS—Special
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WASHERS—Spring
American Nut & Bolt Fastener Co., Pittsburgh.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, Ohio.
Eaton Mfg. Co., Massillon, Ohio.
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.
Kantlink Spring Washers, 616 Wrigley Bldg., Chicago, Ill.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., The, Newark, N. J.
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.
Thompson-Bremer & Co., 1640 W. Hubbard St., Chicago, Ill.
Washburn Co., The, Worcester, Mass.

WASHING MACHINES—Industrial
Mahon, R. C., Co., Detroit, Mich.

WELDED STEEL MACHINE FRAMES
Kirk & Blum Mfg. Co., The, Cincinnati, Ohio.
Koch, George, Sons, Inc., Evansville, Ind.
Mahon, R. C., Co., Detroit, Mich.

WELDER CONTROL—For Spot, Butt & Projection Welding Machines
Electric Controller & Mfg. Co., The, Cleveland.

WELDING
Heintz Mfg. Co., Philadelphia, Pa.
Morrison Metalweld Process, Inc., 1436 Bailey Ave., Buffalo, N. Y.
National Cylinder Gas Co., Chicago, Ill.

WELDING—Electric
Federal Machine & Welder Co., Warren, Ohio.
Hobart Bros., Troy, Ohio.
Lincoln Electric Co., The, Cleveland.
Una Welding, Inc., Cleveland, Ohio.
Westinghouse Elec. & Mfg. Co., East Ptgh.

WELDING—Thermit
Metal & Thermit Corp., 120 Broadway, N. Y. C.

WELDING CONTACTORS
Clark Controller Co., The, Cleveland.

WELDING AND CUTTING MACHINES AND EQUIPMENT—Oxy-Acetylene
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.
Weldit Acetylene Co., Detroit, Mich.

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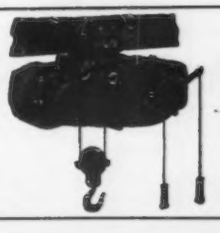
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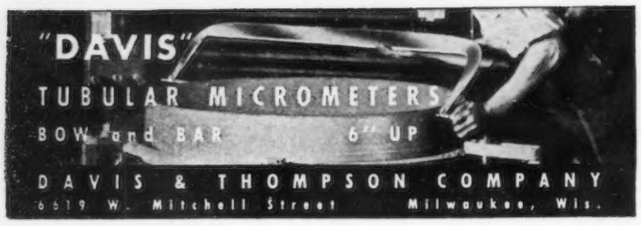

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WELDING MACHINES—Butt
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.
Taylor-Winfield Corp., The, Warren, Ohio.

WELDING MACHINES—Electric Arc
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland.
Una Welding, Inc., Cleveland, Ohio.
Westinghouse Elec. & Mfg. Co., East Pgh.

WELDING MACHINES—Electric Arc, Second-Hand. (See Clearing House Section)

WELDING MACHINES—Flash
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.
Taylor-Winfield Corp., The, Warren, Ohio.

WELDING MACHINES—Press
Federal Machine & Welder Co., Warren, Ohio.
Taylor-Winfield Corp., The, Warren, Ohio.

WELDING MACHINES—Resistance
Federal Machine & Welder Co., Warren, Ohio.
Taylor-Winfield Corp., The, Warren, Ohio.

WELDING MACHINES—Seam
Federal Machine & Welder Co., Warren, Ohio.
Taylor-Winfield Corp., The, Warren, Ohio.

WELDING MACHINES—Spot
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.
Taylor-Winfield Corp., The, Warren, Ohio.

WHEELS—Rolled Steel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Standard Steel Wks. Div. The Baldwin Locomotive Works, Philla., Pa.

WHEELS—Seam Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh.

WIRE—Barb
Pittsburgh (Pa.) Steel Co.

WIRE—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

WIRE—Flat, Round, Square or Special Shapes
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Laclede Steel Co., St. Louis, Mo.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE—Insulated
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
General Electric Co., Schenectady, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE—Mattress
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE—Netting
Ludlow-Saylor Wire Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Cortland, N. Y.

WIRE—Piano and Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Webb Wire Works, New Brunswick, N. J.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

WIRE—Special Drawn Shapes
Rathbone, A. B. & J., Palmer, Mass.

WIRE—Spring
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Roebling, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Spring (Music)
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Webb Wire Works, New Brunswick, N. J.

WIRE—Stainless Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.
Rustless Iron & Steel Corp., Baltimore, Md.
Webb Wire Works, New Brunswick, N. J.

WIRE—Steel
Bethlehem (Pa.) Steel Company.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Wickwire Brothers, Cortland, N. Y.

WIRE—Welding
Air Reduction, 60 East 42nd St., N. Y. C.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh (Pa.) Steel Co.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Una Welding, Inc., Cleveland, Ohio.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH
Buffalo (N. Y.) Wire Wks. Co., Inc.
Ludlow-Saylor Wire Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE DRAWING MACHINERY—See Wire Mill Mchry. & Equip.

WIRE DRAWING, STRAIGHTENING & CUTTING MACHINERY
Ajax Mfg. Co., The, Cleveland.

WIRE FORMING MACHINERY
Ajax Mfg. Co., The, Cleveland.
Baird Mch. Co., The, Bridgeport, Conn.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Torrington (Conn.) Mfg. Co., The.

WIRE MILL MACHINERY AND EQUIPMENT
Lewis Machine Co., The, 3455 E. 76th St., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Waterbury (Ct.) Farrel Fdry. & Mach. Co., The.

WIRE PRODUCTS
American Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Buffalo (N. Y.) Wire Wks. Co., Inc.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE PRODUCTS—Formed Wire
American Spring & Mfg. Corp., Holly, Mich.
Cuyahoga Spring Co., The, Cleveland.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Jeschke Wire & Specialty Co., 315 Industrial Ave., Crawfordsville, Ind.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE ROPE
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Bethlehem (Pa.) Steel Company.
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Jones & Laughlin Steel Corp., Pittsburgh.
Leschen, A., & Sons Rope Co., St. Louis, Mo.
Macwhyte Co., Kenosha, Wisc.
Roebling's, John A., Sons Co., Trenton, N. J.
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Ushco Mfg. Co., Inc., 135 Tonawanda St., Buffalo, N. Y.

WRENCHES—Tap
North Bros. Mfg. Co., Philadelphia, Pa.

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New Jersey Zinc Co., The, 160 Front St., New York City.

ZINC—SLAB (Spelter)
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

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8'6" Loy & Nawrath, M.D. Capacity 10 Gauge
10' Geo. A. Ohl, M.D. Capacity 10 Gauge

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No. 7 Williams & White, Motor Driven. Face of Crosshead, 16"x70". Stroke 22"
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5 ton Shaw	47'	Span 220/3/60 A.C.
5 ton Shepard	75'	Span 220 Volt D.C.
5 ton Whiting	91'	Span 220 Volt D.C.
5 ton Northern	100'	Span 220 Volt D.C.
10 ton Whiting	27'4¾"	Span 440/3/60 A.C.
10 ton Niles	50'	Span 220 Volt D.C.
15 ton Toledo	27'6"	Span 440/3/60 A.C.
20 ton Northern	65'	Span 220 Volt D.C.
25 ton Niles	30'	Span 220 Volt D.C.
25 ton Cleveland	75'	Span 220 Volt D.C.
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300 ton Chambersburg Self-Contained Four Column Hydro-Pneumatic Press, 12" dia. of ram, 18" stroke, 49" Between Columns
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760 ton Southwark Vertical Press, 20" Stroke, 41½"x19" Between Columns

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PRESSES—MISCELLANEOUS
300 ton Southwark Hydraulic Shell Piercing Four Column Press, 41"x65" Between Columns, 48" Dia. Ram, 48" Stroke
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D-45 Ferracute Press. Horizontal double end. Screw type. 36" ram stroke

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PUNCHES—MULTIPLE
No. 4 Hilles & Jones, Arr. for M.D. Capacity 48 1" holes thru ¼" or 475 tons ram pressure
No. 7 Hilles & Jones Automatic Gag Drum Control. Cap. 40 13/16" holes thru ⅝" Plate. Eq. Thomas Spacing Table
No. 32 Williams & White with Thomas Spacing Table, M.D. Will handle 8' wide plate up to 30' long

PUNCHES & SHEAR COMBINATIONS
No. 4 Hilles & Jones Double End, M.D. 48" Throat. Capacity Punch 1½" through. Each end of machine equipped with Lysholm Table
No. 6 Beatty Double End, M.D. 16" Throat. Capacity Punch 1" through 1"
Hilles & Jones Punch, Sle. End, M.D. Thr. 60". Cap. Punch 2" through 1½" with Lysholm Table
Type G Cleveland Single End, Arr. for M.D. 12" Throat. Capacity Punch 2" through 1"
Lysholm Double End, M.D. 44" Throats. Capacity 1⅛" thru ⅞". All steel

ROLLS—ANGLE BENDING
4"x4"x½" Bertsch Initial Type, Drop End Housing, Motor Driven

ROLL—CORRUGATING CURVING
10' Bertsch Initial Type, Belt Drive. Capacity 3/16". 2.66 Corrugations

ROLLS—PLATE STRAIGHTENING
96" Newbold, Arr. for M.D. Nine 14" Dia. Rolls. Capacity 1¼" Plate

ROLL—TAPER FORGING
No. 1 Ajax, Belt Driven

ROLLING MILLS
10"x12" UE&F Co. Single Stand Two High
10"x16" UE&F Co. Single Stand Two High
12"x15" Mackintosh Single Stand Two High
12"x20" Philadelphia Single Stand Two High
12"x36" Lewis Single Stand Two High
14"x42" Garrison Lead Mill, Single Stand 2 High
16"x19" Waterbury Farrel Four Stand Two High
16"x20" Waterbury Farrel Single Stand Two High
31"x76" Farrel F&M Co. Two Stand Two High
9" Belgian Type Bar Mill, 2 Stands 3 High, 2 Stands 2 High
16" Garrison Bar Mill, 2 Stands 3 High, 1 Stand 2 High
19" Morgan Bar & Skelp Mill, Eight Stand
24" Mackintosh Bar Mill, 2 Stands 3 High
15⅞"x46" Aetna Std. Engr. Co. Tube Mill Single Stand Two High
23" Cold Roll Tin Plate Sheet Mill
24" Cold Roll Tin Plate Sheet Mill
30" Morgan Billet Mill Three High

SAWS
No. 0 Ryerson Friction Saw, M.D. Capacity 8" I-Beams, ⅝" Square, 1" Round, 4"x4"x ⅝" Angles, 8" Channels, 3½" Pipe
48" Ryerson Friction Saw Motor Driven. Hydraulic Feed

SHEARS—ANGLE
Long & Allstatter Double Angle Shear, Arr. for M.D. Capacity 4"x4"x½"
Hilles & Jones No. 2 Double Angle Shear, Arr. for M.D. Cap. 6"x6"x⅝"

SHEARS—BAR
Mesta Guillotine Type Steel Frame, Arr. for M.D. Capacity 6" Square, 26" Between Uprights

SHEARS—GATE
84" Hilles & Jones No. 6, B.D. Capacity ⅞" Plate
96" Hilles & Jones No. 6, Arr. for M.D. Capacity ⅞" Plate
144" Hilles & Jones No. 7, Arr. for M.D. Capacity 1" Plate

SHEARS—HYDRAULIC
350 ton Morgan Three Cylinder Up Cut Hydraulic Shear. Capacity 10"x10" hot steel
900 ton Steam Hydraulic Shear. Complete with Intensifier & Gauge for cutting slabs 12" min. to 16' max. Stroke 32"x8"

SHEARS—ROTARY
Newbold Double Rotary Shear. Knife Dia. 15". Max. Cut 100" Wide, Min. 8"
No. 40A Quickwork Rotary Shear, Arr. for Motor drive. Capacity ½" Plate. Complete with Circle Cutting Attachment

SHEAR—ROTARY FLYING
United Engineering & Foundry Co., motor driven. 1" rounds up to 2"x⅝" flats

SHEARS—SQUARING
60" Hilles & Jones No. 2, Belt Drive. Capacity ¼" Plate
96" Wais & Roos, Arr. for M.D. Cap. ¼"

SPACING TABLE
Beatty Quick Acting Spacing Table, Arranged to handle Angles in Single Pairs or Double Pairs. Max. depth I beam for flange punching 24" Max. Size I-beam for Web punching 30". Will handle material 50' long

SPRING COILING MACHINE
No. 1 Sleeper & Hartley Universal Model No. 666-48". Capacity .015" to .080" inclusive

STRAIGHTENERS
No. 0 Medart, Arr. for M.D. Timken Equipped. Capacity ¼" to 1½" dia. bars any length
⅝" Hallden No. 2 Straightening & Cut-off Machine. Arr. for M.D. 12' Cut-off
⅜", 3/16", ¼", ½" Shuster Rotary Straightening Cut-off Machines
United Engineering & Fdry. Co. Straighteners of Gas Press M.D. Capacity 1½" to 5" tubing

TESTING MACHINES
4,000 lb. Riehle Bros. Universal
100,000 lb. Olsen Universal, Motor Driven

WIRE DRAWING MACHINES
No. 12-22 Vaugh Motobloc, Arr. for M.D. Block 30" Dia. Will draw stock up to 1 1/16" dia. or finished wire 1" dia.

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ENGINE LATHES

All have quick change gears unless otherwise noted.

10"x5' Pratt & Whitney Toolmakers.
12"x6' Monarch, double back gears.
13"x6' Willard, taper attachment.
14"x6' Lodge & Shipley, geared head.
14"x6' Monarch, double back gears, T.A.
14"x8' Lodge & Shipley, patent head.
16"x6' Cincinnati, double back gears.
16"x6' Hendey, cone drive.
16"x6' Monarch, double back gears.
16"x6' Monarch, motor in base.
16"x8' Reed Prentice, geared head, T.A.
16"x9' Lehmann, double back gears.
16"x9' Lehmann, selective geared head.
16"x10' Leblond. Taper attachment.
17"x8' Leblond, double back gears.
18"x6' American, double back gears.
18"x9' Chard, double back gears.
20"x10' American.
21"x18' Leblond, heavy duty.
22"x10' Davis, double back geared.
22"x12' Morris, 12-speed geared head.
23"x10' Rahn Larmon.
24"x10' Lodge & Shipley, geared head.
24"x10' Hendey, loose change gear.
24"x10' Leblond, double back gears.
24"x10' Schumacher & Boye, double back gears, T.A.
24"-48"x10' Rahn Larmon extension bed gap lathe.
24"x12' Lodge & Shipley, patent head.
24"x16' Schumacher Boye.
26"x11' Wickes, double back geared.
26"x13' Wickes, double back geared.
26"x15' American geared head.
30"x12' Lodge & Shipley, double back geared.

TURRET LATHES

Most of these can be supplied either with bar feed and automatic chuck or arranged for chucking work.

1" No. 2 Warner & Swasey (14" swing).
1" No. 2 Milholland (14" swing).
1⅛" No. 2SP Garvin (10½" swing).
1-5/16" No. 3 Foster (14" swing).
1½" No. 4 Bardons & Oliver (17½").
1½" Cincinnati Acme (18" swing).
1-13/16" No. 5 Foster (17½" swing).
2¼"x26" Greenlee (20" swing).
2½"x26" Pratt & Whitney (20" swing).
3"x36" Jones & Lamson (14½" swing).
Jones & Lamson (10" swing), 2-spindle.
4"x34" Jones & Lamson, steel head (17" swing).
18" Libby.
21" Gisholt.
24" Steinle.
24" Bullard New Era, no side head.

PRODUCTION LATHES

3½"x8' Lo-Swing, 2 carriages.
7" Sundstrand Mfg.
9" Sundstrand Mfg.
9" No. 9 Leblond, geared head multicut.
9"x14" Porter Cable Mfg.
9"x20" Porter Cable Mfg.
12"x4' and 12"x3' Blount speed lathe.
13"x6' Automatic threading lathes.
16"x5' Monarch Mfg.
16"x6' Monarch, motor-in-base.
16"x6' Sundstrand Mfg.
16"x10' Leblond rapid production.
17"x6' Leblond Mfg.
17"x8' Leblond geared head Mfg.
18"x7'-6" Wickes geared head.
20"x8' Wickes geared head.
Melling 4-cylinder camshaft lathe.
Gisholt Simplimatic.

PLANERS

24"x24"x24" Cincinnati crank type.
24"x24"x8' Rockford. 1 rail head.
32"x32"x12' Niles. 1 rail, 1 side head.
36"x36"x10' Detrick Harvey, open side.
36"x36"x16' Cleveland, open side.
56"x56"x16' Gray, 4 heads.

LATE PURCHASES

15"x9¼"x12" Ingersoll-Rand compressor.
No. 2 Cincinnati centerless grinder.
No. 45 Heald, bore-matic.
No. 72A3 Heald internal.
4' Dreses radial drill.
5' American radial drill.
24H Gould & Eberhard gear hobber.
No. 1 Lees Bradner gear hobber.
No. 2 Kempsmith univ. mill.
No. 4 Cincinnati univ. mill.
2½" Cleveland horizontal boring mill.
60" Colburn vertical boring mill.
60" Bullard maximill.

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No. 2-5" Bar Barrett, Extension Bed
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52" Gisholt
54" Colburn
60" Gisholt, Motor Drive
72" King, Motor Drive
72" Niles-Bement-Pond, Motor Drive
72" Bickford
10' Niles
Drills, 1, 2, Spdl. Leland-Gifford
4 Spdl. Avey, 30" sw.
4 spdl. Henry & Wright
4, 6 Spdl. Leland-Gifford
No. 25-24" Foote-Burt, 1 Spdl.
No. 2 Colburn, 3 & 4 spindle
No. 4 Foote-Burt Rail, 5 spdl.
No. 1, No. 3, No. 4 Baush Multiple
No. 41 Nateo Multiple
Radials, 3' Western, Plain
4' American Plain
4' Western, Plain, Motor on Column
6' Fosdick Plain
6' Reed-Prentice Plain
6' Western, Plain
6' American, Plain
7', 8' Western, Heavy Plain
Gear Cutters, No. ½ Pfauter Hobber, M.D.
No. 1, No. 2, Pfauter Hobber
No. 3—26" Brown & Sharpe
No. 4—36" Brown & Sharpe
No. 5—48" Brown & Sharpe
No. 6—72" Brown & Sharpe
No. 6-A—72" Cincinnati
Nos. 6, 61, 624 Fellows
18" Gleason Bevel Generator, M.D.
96" Newton Spur Gear
No. 36BM G. & E. Bevel Rougher
Grinders, No. 2½ Universal (Bath Type)
No. 2 Thompson Universal
No. 4—12"x66" Landis Universal
No. 22—12" Heald Rotary Surface
No. 25—16" Heald Rotary Surface
No. 16—26" Blanchard, M.D.
16"x32" Landis Crank Shaft

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6"x18"	10"x50"	18"x 50"
6"x32"	10"x72"	16"x 72"
10"x18"	10"-15" GAPx72"	18"x 96"
10"x24"	14"x36"	18"-24" GAPx 96"
10"-15" GAPx24"	14"x50"	21"x 96"
10"x36"	14"x96"	23"x120"

Lathes, 18"x8' Lodge & Shipley
18"x12' American Geared Head
20"x10', 12' L. & S. Grd. Hd., M.D.
20"-40"x10' Rahn-Larmon Geared Head, Sliding Bed Gap
24"x12' American
24"x12' Flather
24"x18' American Geared Head
24"x20' L. & S. Grd. Hd., Taper Att.
27"x18' Amer. Grd. Hd., Taper Att.
30"x12' Lodge & Shipley Grd. Hd.
36"x16' American
36"x24' Bradford, Triple Geared, Taper Att.
40"x12' Fifield
46"x30' Houston, Stanwood & Gamble, M.D.
Millers, No. 5-B, No. 6 Becker Vertical
Model "C2" Becker Vertical
No. 5 Brown & Sharpe Vertical
No. 2 Cincinnati Universal
No. 3 Garvin Duplex
No. 4 Hendey Mfg.
Type "B" Briggs Mfg.
No. 7-H Becker Mfg.
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24"x24"x12' Ingersoll Adj. Rail
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Planers, 24"x24"x6' Rockford
24"x24"x6' Cincinnati
24"x24"x12' Gray
30"x30"x8' American
30"x30"x18' Cincinnati
36"x36"x12' American
36"x36"x8', 18' Cincinnati
40"x30"x7' Gray
42"x42"x14' Gray
48"x48"x10' Niles-Bement-Pond
60"x48"x20' Hamilton
72"x60"x16' American
Presses, No. 01, No. 1 V. & O., M.D.
No. 1½ V. & O., Geared, M.D.
No. 20 Bliss, Motor Drive
No. CG-24 Ferracute, Motor Drive
No. 5 V. & O., Geared M.D.
Turret Lathes—No. 6—2¼" Warner & Swasey
18" Libby-International, 5" H.S.
No. 3-A Warner & Swasey
24" Gisholt, Taper Att., 6¼" H.S.
2¼"x26" Greenlee, A.C. & B.F.
3¼"x40" Greenlee, A.C. & B.F.
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TURRET LATHES

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No. 4 WARNER & SWASEY Universal.
No. 7 FOSTER, Geared Head, 2½" Spdle.
PRATT & WHITNEY Geared Head, 2½" Spdle.
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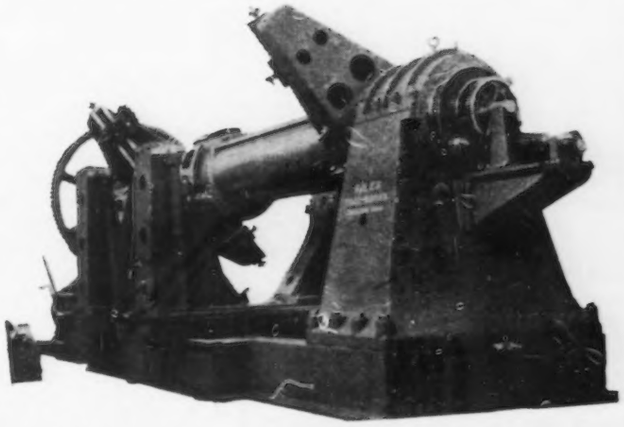

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#5C B&S Vertical
#C Becker Vertical
#2M P&J Vertical
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28" Cinn. Semi-Automatic
60" Garvin Duplex
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36"x14' BRIDGEFORD GEARED HEAD LATHE, raised to 48", with ball turning attachment.
26" LIBBY TURRET LATHE, 7½" Hole, M.D.
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No. 5A POTTER & JOHNSTON, Serial 21,000.
4" Bar DETRICK & HARVEY (BETHLEHEM) Floor Type Horizontal Boring Mill, M.D.

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Advertisers in This Issue

A

Aaron Machinery Co. 128
Allegheny Ludlum Steel Corp. 123
Aluminum Co. of America 12-13
American Air Compressor Corp. ... 129
American Chemical Paint 74
American Monorail Co., The 55
American Steel & Wire Co. 11
Armstrong-Blum Mfg. Co. 119
Atlantic Machinery Corp. 128
Atlas Car & Mfg. Co., The 99
Atlas Drop Forge Co. 121

B

Baird Machine Co., The 16
Bardons & Oliver, Inc. 115
Barnes, Wallace, Co., Div. Associated Spring Corp. 10
Belyea Co., Inc. 129
Bennett-Rafkin Mch. Tool Co., Inc. 129
Bethlehem Steel Co. 3, 9
Bixby, R. W., Inc. 131
Bolling, Stewart, & Co., Inc. 130
Brassert, H. A., & Co., The 120
Buffalo Wire Works Co. 115

C

Canton Foundry & Machine Co., The, Div. of The Hill Acme Co. 120
Carnegie-Illinois Steel Corp. 6-7
Carpenter Steel Co., The 53
Cattie, Jos. P., & Bros. 122
Chambersburg Engineering Co. ... 18
Chicago Rawhide Mfg. Co., The. 4
Cincinnati Bickford Tool Co. 17
Cincinnati Machinery & Supply Co. 127
Clark Controller Co., The 15
Cleveland Steel Tool Co., The 123
Cleveland Twist Drill Co. 14
Columbia Steel Co. 6-7, 11
Commonwealth Brass Corp. 109
Consolidated Machine Tool Corp. 122
Continental Salvage & Mchry. Corp. 130
Crawford, F. H., & Co., Inc. 131
Crosby Co., The 116

D

Dail Steel Products Co. 118
Daley & Sibley Mchry. Dealers, Inc. 129
Davis & Thompson Co. 117, 124
Detroit Hoist & Machine Co. 123
Donahue Steel Products Co. 128, 129
Dony, D. E., Mchry. Co. 128
Dreifus, Chas., Co. 130
Dreis & Krump Mfg. Co. 116
Dunbar Bros. Co., Div. Associated Spring Corp. 91
Duquesne Elec. & Mfg. Co. 129
Duraloy Co., The 124

E

Eastern Mach. Screw Corp., The. 122
Emerman, Louis E., & Co. 127, 129
Enterprise Galvanizing Co. 121
Espen-Lucas Mach. Wks., The 120
Essley, E. L., Mchry. Co., The 127
Ex-Cell-O Corp. 105

F

Firth-Sterling Steel Co. 124
Foster, L. B., Co., Inc. 130
Frank, M. K. 130

G

Globe Bolt & Screw Co. 131
Goldman, Harvey, & Co. 127
Goodman Electric Machinery Co. 130
Goss & DeLeeuw Mach. Co. 122
Guyan Machinery Co. 130

H

Hanna Furnace Corp., The 107
Harrington & King Perforating Co., The 115
Hayward Co., The 124
Hendrick Mfg. Co. 113, 122
Hill-Clarke Machinery Co. 126
Hillside Fluor Spar Mines 72
Hindley Mfg. Co. 119
Hyman, Joseph, & Sons 128
Hyman-Michaels Co. 130

I

Indianapolis Machinery & Supply Co., Inc. 128
Inland Machinery Co. 126
Inland Steel Co. 22
Interborough Scrap Iron & Metal Co. 130
International Nickel Co., Inc. 101
Iron & Steel Products, Inc. 130
Iroquois Machinery Co. 128

J

Jay, Paul, Electrical Mchry. Co. .. 130
Jennings, Jira Thayer 131

K

Kearney & Trecker Corp. 49
Kerlow Steel Flooring Co. 123
Kester Solder Co. 124
Keystone Machinery Co. 129
Knox, Earl E., Co. 129

L

Land, L. J., and Company 130
Lang Machinery Co. 126
Leland-Gifford Co. 123
Lindberg Engineering Co. 59
Lindemuth, Lewis B. 120
Ludlow-Saylor Wire Co. Inside Back Cover
Lucas Machine Tool Co., The 124

M

MacCabe, T. B., Co. 130
Marr-Galbreath Machinery Co. 128
Meaker Co., The 111
Midland Steel & Equip. Co. 131
Miles Machinery Co. 126
Monarch Steel Co. 124
Morey Machinery Co., Inc. 109, 113, 118, 126
Moskowitz Bros. 130
Motor Repair & Mfg. Co. 129
Moyer, J. N. 129
Mundt, Chas., & Sons 111

N

National Business Bourse 131
National Machinery Exchange 129
National Steel Corp. 107
National Tube Co. 6-7
New Albany Machine Mfg. Co. .. 120
Nilson, A. H., Machine Co. 122

O

O'Brien Machinery Co., The 129
Ohio Electric Mfg. Co., The 122
Ohio Ferro-Alloys Corp. ... Front Cover
Ohio Locomotive Crane Co., The. 121
Ottemiller, Wm. H., Co., Inc. 122

P

Poor & Co., Canton Forge & Axle Works 124
Pratt & Whitney Div., Niles-Bement-Pond Co. 51
Progressive Mfg. Co., The 119

R

Ritterbush & Co., Inc. 125
Rockford Drop Forge Co. 115
Rosenkranz, Weisbecker & Co., Inc. 126
Ryerson, Jos. T., & Son, Inc. 121

S

Samuel, Frank, & Co., Inc. 116
San-Equipment, Inc. 131
Sauereisen Cements Co. 123
Scully-Jones & Co. 130
Scully Steel Products Co. 6-7
Seneca Wire & Mfg. Co., The ... 120
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc. 100
Sheffield Gage Corp. 57
Shenango-Penn Mold Co. 118
Simmons Machine Tool Corp. 127
Southern Business Brokers 131
Southern Galvanizing Co. 120
Standard Pressed Steel Co. 121
Standard Steel Wks. Div., Baldwin Locomotive Works 73
Stanhope, R. C., Inc. 130
Stanley Works, The 120
Stone, R. J. 130
Strand, N. A., & Co. 121
Swift Electric Welder Co. 117

T

Tennessee Coal, Iron & Railroad Co. 6-7
Timken Roller Bearing Co., The, Steel & Tube Div. ..... Back Cover
Torrington Co., The 117

U

Una Welding, Inc. 107
U. S. Steel Corp., Subsidiaries .. 6-7, 11
U. S. Steel Export Co. 6-7, 11
U. S. Steel Wire Spring Co. 121
Ushco Manufacturing Co., Inc. 123

V

V & O Press Co., The 123

W

Warner & Swasey Co. 5
Webb Wire Wks., The 119
Wellman Engineering Co. 117
Westinghouse Air Brake Co., Industrial Div. 72
Westinghouse Electric & Mfg. Co. 20
Westinghouse Electric & Mfg. Co., Lighting Div. 8
West Penn Machinery Co. 128
Wetherell Bros. Co. 121
Wheeling Steel Corp. 118
Whitehead Stamping Co. 113
Whiting Corp. ..... Inside Front Cover
Wigglesworth Machinery Co. 128
Woodmere Scrap Iron & Metal Co. 130
Worcester Stamped Metal Co. 119

CLASSIFIED SECTION

Business Opportunities 131
Clearing House 125-130
Employment Exchange 131
Parts Made to Order — Contract Work — Services See First and Third Issues
Wanted 131

Free Industrial Literature 61-62

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